THE

# JOURNAL

OF

# GAS LIGHTING

AND

# WATER SUPPLY.

VOL. CXXVIII.

OCTOBER TO DECEMBER, 1914.

LONDON:

WALTER KING,

11, BOLT COURT, FLEET STREET, E.C.

1914.

# JOURNAL OF GAS LIGHTING & WATER SUPPLY.

EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. CXXVIII., No. 2682.] TUESDAY, OCTOBER 6, 1914. [66TH YEAR.


## EDITORIAL NOTES.

### The Gas Industry and the Expansion of Trade Campaign.

THE campaign which has been growing in strength since its inauguration for—using the opportunity of Germany's commercial disablement—obtaining a transmission of part of that country's trade to this country has been fruitful in more ways than one, and to this aspect of the matter reference may be made presently. The British gas industry has a very deep and solid interest in this subject. Patent even to the blind are the interests of the gas plant, fittings, and accessories makers. The interest of the fundamental or gas-supply part of the industry is of another order. Town gas cannot be exported over the seas; but coal can, and it can be carbonized for supplying gas for use in Germany's and Austria's productive industries that are in favoured competition, through our free trade policy, with this country. The secondary products, too, can be competitively employed. A large part of the coal which is carbonized to supply foreign industry could be dealt with equally well in this country. Anyway, if expansion can be secured in home and export trade, the better for a territory circumscribed industry such as that of gas supply. The more home trade there is, the greater the scope for the gas industry, and for its several products; and the greater the prosperity of the country generally, the better for the industry in every part of the social and industrial scales. Of this we are sure, that the concern of the gas industry in the present movement should be a very real one; and it calls for its co-operation and support in any way that can be devised. If anyone has considered this matter, then let us hear from him through our "Correspondence" columns.

The new trade campaign, as we have said, has been enlightening in more ways than one. It has been shown that any permanent transference of any part of Germany's trade is not to be accomplished by a mere stroke of the pen, nor by individual resolution while the country is at war with Germany, and while the blood is at fever-heat over the dastardly acts which have, through its armies, disgraced the German nation. Only by definite ways is lasting trade benefit to be derived from the present situation, and those ways are organization and system, promptly taken in hand, and then gradually and seriously developed. A leaf may be taken for guidance in this matter from the huge volume of German industrial and trading policy. At one time, those of myopic tendency were prone to attribute Germany's successes, during the last few decades, in industry and the markets of the world solely to their schemes of scientific training and application. But these were only one part of a great, carefully ordered industrial and commercial system and organization, the like of which has never been attained in this country. This is one of the eye-opening revelations of the present campaign; and the disclosure has brought us face to face with the cast-iron fact that, if we are to forge ahead in trade development at the same rate as the Germans have done (with the advantage of a fair name in our favour), then our manufacturing and our trading machinery must be brought from the loose disjointed condition in which it now is to a more systematic and enterprising state. We boast of being an industrial nation. We see that the differences between our methods and those of Germany have resulted in a large advantage to that country in many ways. The trading methods of the latter have had proficiency and efficiency stamped upon them; and they have used these methods in a "turning movement" upon our manufacturers, who have as a result quietly submitted to both a front and flank attack. The manufacturers and traders of Germany have (unlike our own) been made to feel that they are part of, and indispensable to, the nation; and that in every way in which they can benefit themselves as individuals and firms, they are benefiting their country. The nation has helped the industries. And the industries have responded by spreading their lines of communication and agencies all over the world. Their missionaries have gone to the uttermost parts of the earth, and have found their way to, and have established themselves in, the very centre of trade in every country, large and small. The commercial wealth so created has probably not all been put to the best use. The ambition, which has reached almost to a mania, to occupy quickly a larger potential place in the world, has led to a not inconsiderable part of the wealth earned being devoted to the setting-up of an armed might with which it was intended to subjugate the world, for the further advance of the material interests of the country, instead of doing so by the more peaceful and diplomatic means which up to the present have been found so successful.

The British manufacturer and trader have been at a distinct disadvantage as against the German manufacturer and trader. The German Government have, in many ways, encouraged industry, recognizing that industry and commerce are the parts most essential to the nation's prosperity and greatness. Our own Government have just awakened to the immensity of the possibilities of this country at the expense of Germany and Austria; and now probably, through the aid of the Government and the Board of Trade, through the various Investigating Committees that have been formed by manufacturers and merchants, and through the patriotic spirit that rules to-day, we may enter upon a new and closer expanded order of things by the development of a better system, co-operation, and a greater recognition of the fact that industry and commerce are our very life-blood, and vital to our larger existence. The Government can work to do something more serious than they have done before by a more expert organization—an organization manned by the right men—placing the manufacturers of this country in more intimate touch than now with markets of the outer world. That work, it is common knowledge, is very indifferently done at the present time. There is also the question as to the financing of new promising inventions, and facilitating advances to manufacturers. Many manufacturers avow that they have been placed at a serious disadvantage through their German rivals having in the past been able to get readily financial advances up to 60 per cent. of the value of their orders. The financiers of Germany have seen how their own fortunes are mixed up with those of industry and commerce; and they have acted accordingly. There is work in this direction that should, and must, be done to countervail the existing competitive disability. Unquestionably, there is, in normal times, a respectable amount of capital to be obtained from investors in this country, if they could be assured of two things, which are as to the substantiality and prospects of the enterprise in which they are invited to place their money, and as to the Legislature changing its policy of putting undue burdens upon trade enterprise and investment which jeopardize a fair return. These are matters that will probably be forced upon the attention of the Government, now that they are apparently willing to help in fostering further national prosperity, through the proper channels of industry and commerce, and are disposed to appoint Committees to consider all relative matters. They have already appointed a Committee to deal with the subject of the manufacture of chemicals; and it is probable that a similar step will be taken with regard to other trades.

We will not deal here with some of the points that have been raised in this connection, to show the various methods that have been adopted by Germany in developing business abroad, including the complete network established by its traders in each country for benefiting their own. The reward of their enterprise has been great; we owe them something now for having clearly divulged to us what a foolish country this has been up to the present through not systematically working to make itself more self-reliant. But there is another aspect of the question to which a few words may be devoted, and that is the one of co-operation. All

the nations of the world for life and prosperity are interdependent. But Germany has shown how she has succeeded in making herself independent almost to the maximum line through internal co-operation; while, at the same time, she has contrived to make other countries largely dependent upon her manufactures—she being dependent on other countries only to the extent of her absolute necessities. The lesson is one that should go home. It is all a matter of co-operation. There must be co-operation here if good is to result from the present campaign. Our manufacturers must have inducements and security before they can commit themselves largely to filling the part (which could only be done gradually) that Germany and Austria have taken in meeting our requirements. Current sentiment is no doubt very real; but it is an intangible security. British manufacturers and traders know that the German bagman will be here directly the war is over, tempting by temporarily offering goods at ridiculously low prices in order to recapture lost trade. Will sentiment stand resolute against this? We have our doubts. Obligation produced by systematic co-operation would. The gas industry wants to see local industries flourish and a higher level of prosperity established throughout the land. What part then is the industry prepared to take in the present campaign? Will it undertake to give its orders to British manufacturers, and insist on goods purchased being certified as British made? An assurance of orders will be the incentive to manufacturers putting down the requisite fresh plant. Further, can gas undertakings do anything among their consumers to stop the purchase of shoddy imported articles? If they can, so much the better.

Obligation, however, is not one-sided. The gas industry is not without some knowledge of combinations and secret agreements among manufacturers. Any pledge to patronize solely British industry must be accompanied by an obligation on the part of the manufacturers concerned not to take, in fixing prices, advantage of the pledge. We are mindful, and gas managements must be also mindful, of the fact that, while British makers, in several lines of goods in which we are interested, cannot be beaten in respect of quality and efficiency, they are at certain disadvantage in producing costs—in one way, through the cost of labour. There we come up against a point for the trade unionists of the country. If the two-and-a-half million trade unionists in the United Kingdom would decline to buy German goods made by labour paid at a rate less than the British rates, there would be good resolution and co-operation there. It is up to them in defence of their principles to ostracize all such goods. The very idea, too, of the curtailment of employment in this country through the purchase of goods made by low-paid labour abroad ought to be repugnant to our trade unionist friends. There should be little difficulty in getting them to see this. This question of co-operation as a vital point in the campaign is one on which there could be considerable enlargement—running from home co-operation to the co-operation with our colonies and countries that boast of being civilized, and evidence by their actions that they are so. The gas industry's interest in this national question is not by any means a small one; but the number of the sides of the question precludes any comprehensive survey of them in a single article.

## The Regenerators at Work in Dublin—Two Official Resignations.

However unfortunate the shareholders of the Alliance and Dublin Consumers' Gas Company may consider themselves in not receiving any dividend for the past half year, the speeches made at their meeting last week should convince them that they have something for which to be thankful in that the downhill course of their undertaking has been stopped, and that the prospects for them have considerably brightened. Excepting the large capital account in relation to business done, the whole concern now stands a good chance of presenting a sounder condition, instead of what was obviously a condition to which a description could be applied far from complimentary to anyone who had part in bringing it to that state, by indifference, incompetence, or whatever else may have been the cause. We will not comment upon the past half-year's figures. There would be no use in doing so, seeing that not only was it an exceptional half year for all gas undertakings, but it was doubly so for the Dublin Company—the period having been occupied in taking large steps towards setting the Company's house in order, working upon the joint report of Mr. William Newbigging and Mr. W. R. Herring, upon the recommendations of the former in his new capacity of Consulting Engineer, and on those of the investigating Accountant, Mr. William Cash, F.C.A. It is not surprising, when all is considered, that there is no dividend on this occasion. It must be hard on some shareholders; but the steps taken have necessarily been of a drastic order, to prevent, as quickly as possible, further leakages and further mismanagement.

The stockholders who carefully listened to, or have read, the speeches made at the meeting by the Chairman (Mr. John Murphy) and Mr. F. J. Dickens will have discovered in them good cause for thinking that the report of the investigating experts, which the administration so studiously concealed, contained in it something which was more than the management generally would have cared for their own peace of mind to have had made public. It follows that, if there has been, as is openly acknowledged, so much reforming work to do during the past half year, there was a scandalous amount of looseness in the management generally prior to the agitation which set the investigating machinery in motion, and which, in turn, brought things to a head, and pointed sharply to the imperative necessity of reform, if what should have been one of the leading exemplary gas concerns in the United Kingdom was to be saved from worse conditions. There is no necessity to read between the lines of what was said at the meeting; words were used which have a sufficiently plain meaning for any ordinary intelligence. The Chairman stated that a "great deal" had been done during the six months towards improving the position of the concern. Why was it requisite for a "great deal" to be done? The necessity could not have arisen other than from neglect or incompetence. Some suave expressions were selected to tell shareholders ugly truths. An instance of this is found in the references of the Chairman to the profit and loss account. "Scattered accounts," he said, "due by the Company and properly chargeable to previous "half years had been *overlooked* in the accountants' depart-"ment." Previous half years! It was not during a matter of weeks or months, but "half years" that these scattered accounts had been "*overlooked*." "Overlooked" in a large business concern such as this! Of what character must have been the business system, and of what nature must have been the supervision, that could allow accounts to be "overlooked" in this way? The stockholders may never have a reply to this, but will have to rest satisfied with the information that now "the accounts have been put on a "thoroughly sound foundation," which in itself is a confession without qualification that they were not on such a foundation before.

More serious perhaps than monetary obligations "over-"looked," and accounts not having previously been on a sound basis, is the indictment, through the confessions made, of the technical administration of the Company. There was weakness in that direction. The Chairman acknowledged that the appointment of Mr. William Newbigging had already resulted in "very great" economies being effected. Had the technical administration been all that it should have been, there would not have been scope for "very great" economies. There is the further announcement that the works have been "thoroughly and completely reorganized," which is evidence that there was scope for reorganization. The disclosures made at the meeting are enough to satisfy technical men on many points—one that the old Board had not on it (any more than the Board has now) a man technically qualified to support or to criticize any gas engineering recommendations or management question. Mr. Dickens stated that the cost of handling raw material had hitherto been "very heavy." His explanation of this was that it had been due in part to the position of the retort-houses, which were situated at a point on the works' site farthest from the principal quay at which coals were received, and in part to indifferent organization of the men. What is to be said of the indictment that this contains? We cannot imagine any person having an eye to permanent economy (unless there is some reason unintelligible to an outsider) placing retort-houses at the part of the works most remote from the principal place for coal landing. A considerable capital expenditure would be warranted in getting the retort-houses as near the point of coal reception as possible, as the conveying of raw material about a large works is always a matter of some expense. The grievous waste there has been is obvious from the admission that, since Mr. Newbigging's appearance on the scene, the cost of placing

the coal into the coal-stores has been reduced by one-half, and a still further reduction will be effected when a coal-transporting plant has been provided.

It seems impossible to look anywhere among the operations of the Company, and find that they can be appropriately characterized by the word which has in these days so much prominence and meaning in technical and commercial work—that is, "efficiency." "Efficiency" seems to have had little part in their operations. The Chairman and Mr. Dickens confessed that, both on the works and in the distribution department, the number of men employed was greatly in excess of requirements, and that there has been a considerable saving effected in this connection, "without any loss of efficiency." The last expression seems to have almost an ironical touch about it. It seems to us, reading the speeches at the meeting, that there was not much "efficiency" to be lost; while there was much room for gaining it.

The work of reformation has not yet come to an end, which is further testimony to the exceedingly bad state into which the affairs of the undertaking had been permitted to drop. Only one meaning can be attached to Mr. Dickens's declaration that there is still "ample scope" for improvements and economies in other departments, apart from the works. "Ample scope" suggests a good area of ground upon which to work in order to achieve the maximum of efficiency; and there is no question that Mr. Newbigging, supported by a Board partly convicted of, and wholly convinced as to, a past looseness in administration, is working well to lessen the scope. Whoever has had any responsible part in producing the wasteful conditions that have reigned and the "ample scope" for reformation ought to have forfeited the confidence of the stockholders, the majority of whom appear to be either too indulgent or incapable of appreciating the conditions. We learn that Mr. Francis T. Cotton, the Secretary and Manager, and Mr. W. F. Cotton, the Engineer of the works, have both resigned their positions, and the Board have accepted the resignations. These appear to be the only resignations contemplated. The two gentlemen named have not been solely responsible for the administration of the concern; they are only two out of a number. What stockholders should seek is a list of the whole of the men—administrative and executive—responsible for the circumstances that have called for so much work to be done in suppressing waste, in gaining efficiency, and in replacing slackness by activity? If those who were in any way responsible are still concerned in the administration, are they to be relied upon in the future? Personally, we should imagine that the shock of the present disclosures will have had a salutary effect upon them; and that greater efficiency will be found in future in the administration as well as in the manufacturing and trading departments. The fault lies in the top places, not in the lower ones. If there is not efficiency in the former (on the Board as well as elsewhere), things are bound to go wrong in the latter.

## Reinforced Concrete Work.

THERE are engineers who have not the time to wade through text-books or treatises on a particular subject when searching for general guidance in relation to it; and often all that is required can be gained from a comparatively brief lecture by a man who has studied the theory and had good practical experience. Reinforced concrete has taken its place in gas-works construction, and as a practice has come to stay; as in many situations good use can be found for a combination of materials which gives to the structure additional durability and strength. But not all gas-works engineers have yet incorporated reinforced concrete in their works, though there cannot be many, excepting the very small ones, who have not, up to the present, done so in some form or other. To those who have had experience of reinforced concrete there will be interest, and to those who have not had experience there will be usefulness, in the lecture that Mr. W. Noble Twelvetrees delivered last Saturday before the Manchester and District Junior Gas Association. The lecture was compounded of theoretical and practical information and experience, and so it can be recommended to general consideration.

Though the aggregate area for the use of reinforced concrete is large in gas-works, up to the present time its application has, generally speaking, been limited to certain purposes. Most of the buildings required on gas-works need to-day to be little more than presentable covers for the plant; and therefore new main buildings are simply constructed of light steel framing and 4½-inch panelling. But where reinforcement largely comes in is for the foundations that are needed for heavy plant—retort-benches and retort-machinery, and for the moving plant in other parts of the works, as well as for chimney-stack bases, stage-floors, and coal-stores. These are the chief uses—uses in which compression stresses are predominant, and in which in some cases vibration, through moving machinery and quantities of material, comes largely into play. In all these uses, reinforced concrete is invaluable, particularly when the subsoil is not of a character best suited for heavy plant. Most of this work is of such a simple nature that it does not call for the services of the expert; and so there is not the slightest reason why specialist firms should be engaged to carry it out. Care and common sense, and the application of certain simple rules, in execution, are all that are needed in order to realize what is desired. Several reinforced concrete foundations for retort-benches in which we were interested, carried out direct by gas-works labour now some years ago—two of them for vertical retort installations—are, so far as can be discovered, to-day in as good condition as when first laid down.

If, however, on any work specialist construction firms are engaged, the design should not be left entirely in their hands; for though their experience in some directions is very valuable, they cannot be acquainted, so well as the engineer, with the conditions to which the structural work is to be exposed. This must be a matter upon which combination of knowledge should be brought to bear. This is the case in the construction of gasholder and tar and ammoniacal liquor tanks—especially gasholder tanks. The reinforced concrete specialist's experience in making water-tight circular water-tanks must be very useful in this connection; but his experience does not extend very far yet to the construction of similar tanks which have to bear the weight of guide-columns and have gasholders working in them, with variable stresses brought to bear upon the tanks through both the rise and fall of the lifts and the inconstant forces exerted in different directions by the wind at different stages of the holder's height. Another important point affecting the stability of the reinforced concrete gasholder-tank is that on many gas-works electricity is now largely employed. Moisture and electricity combined have had a detrimental effect upon the stability of some structures such as bridges; and therefore great care in preventing the possibility of the steel reinforcement being attacked by electrical current is highly essential.

Mr. Twelvetrees utters a warning. The under-estimation of requirements and of factors of safety has entered into the competition for trade between specialist firms. Therefore the practice of inviting competitive designs for reinforced concrete work is undesirable. But if it is adopted, there must be a critical examination of the designs, in order to see that the work is capable of successfully meeting all the stresses and other factors that will be brought to bear upon its integrity.

## A Remarkable American Incandescent Lamp.

We should be glad, and we are sure our readers would be equally so, if Mr. Robert Ffrench Pierce, who read a paper at the annual convention of the American Illuminating Engineers, would forward here a sample of the new incandescent gas-lamp to which he referred at the meeting, in order that it might be compared with the best of our productions on this side. Reading the paper, we are left with rather vague notions as to the form of the "old style" lamp with which the "new style" lamp is compared. If the old-style lamp in question is equal in all-round efficiency to the best British made lamps, then we can heartily congratulate Mr. Pierce on having made an advance which will ensure for him renown throughout the gas-lighting industry. He will forgive us, however, if we say frankly that we doubt the success being so large as he represents over the highest of previous achievement, and for the simple reason that it seems too good to be true. The tables towards the end of the paper show such considerable percentage savings in gas, mantles, and burner depreciation, that, taking a long period and using 200 M.H.C.P. units, a saving in cost is exhibited of 50·8 per cent. Every item has been reduced for a given amount of light by the study of the factors contributing to the depreciation of efficiency. This is highly satisfactory; only a closer acquaintance is desired with the improved lamp than is

given in the paper. Numerous tests have been carried out by Mr. Pierce on burners and accessories of all kinds. Testing certain ordinary burners under conditions which may be described as normal, he finds that there is a depreciation in 1000 hours' use of only about 2½ per cent. due to the burner proper, and of 10 per cent. due to the dirtying of the glass cylinder—without adjustments of any kind. He mentions, too, a test of twelve inverted mantles, not one of which failed during 5000 hours.

### Candle Power and Calorific Value.

In the annual report of the American Illuminating Engineering Society, reference is made to a subject in which, as correspondence in our columns not long since showed, Mr. H. E. Jones is interested. It is stated that the New York State Commission have determined, as the result of an extended and careful series of tests, that there is no definite law between the candle power and the heat unit value of artificial gas. Hence, it is contended, that in changing laws specifying candle power, it will not be fair to adopt a specific factor to fix the calorific value from the value of luminous intensity.

### More Commercial Intelligence.

Two more reports by the Commercial Intelligence Branch of the Board of Trade of particular interest to "JOURNAL" readers have been issued within the past fortnight. The first of these, which dealt (among other fertilizers) with sulphate of ammonia, was noticed in our last issue; and the main features of the second one, so far as the gas industry is concerned, will be found reproduced on another page of this number. It deals with fireproof bricks, retorts, &c., and furnishes information which should repay attention by manufacturers in this country. The references to retorts will be read with particular interest. As has already been emphasized, the object with which these reports are prepared, printed, and circulated is to assist British industries to secure trade which has until now been in other hands. The Department are working energetically; and the least that business firms can fairly do is to study the results of these efforts as crystallized in the reports. And the matter need not necessarily end with the reports. The intimation is made, and ought to be noted, that any British manufacturer or merchant who desires to be furnished with more detailed information as to openings affecting his particular business, is invited to put himself in communication with the Director of the Commercial Intelligence Branch of the Board of Trade, at No. 73, Basinghall Street, London, E.C. The Director will then be prepared to give any further particulars possible respecting names of buyers, rates of import duty, &c., or to make special inquiries through H.M. Trade Commissioners and the Trade Correspondents of the Commercial Intelligence Branch in the British Self-Governing Dominions, India, and all other Colonies and Protectorates, or through British Consular Officers in neutral foreign countries.

### Gas as an Investment.

With the Stock Exchange remaining closed, there does not, of course, exist now anything which can be compared with the record of values of securities before the occurrence of the unparalleled financial crisis through which this country—and other countries also in their own degree—has been passing. Brought down to the latest date available, however, the table of Stock Exchange values compiled by the "Bankers' Magazine"—which is always a widely-noticed feature of our contemporary—affords some significant, if dismal, information. The period covered is but the ten days from July 20 to July 30, since when the House has been closed. But what a period this was for the City. The 387 representative stocks selected by the "Bankers' Magazine" suffered a shrinkage in the ten days which exceeded any decline previously experienced even in the space of a month. On July 20 the aggregate value of the 387 securities was £3,370,709,000, and by the 30th of the month this figure had dwindled to £3,182,717,000, a decline of no less than £187,992,000. All classes of stocks are included in the list—Government, industrial, and mining—and practically all shared in the slump; the single exception being a very trifling gain in value by iron, coal, and steel shares, which, of course, include "armament" shares. As to the declines, though so general they were far from being equal in extent. Mining shares, as the most speculative, suffered to the greatest proportionate extent; but British and Foreign Government stocks and Foreign and Colonial railways show badly. Glancing further down the list, it is noticed that the five gas stocks included (which have a nominal capital of £28,635,000) exhibit a decrease of 3·3 per cent., as against an average net decrease of 5·6 per cent. for the 387 securities quoted. This is not at all a bad showing, seeing that 38 commercial industrial shares decreased in value by 5·6 per cent. The state of affairs revealed, however, is not to be wondered at, in view of the stability of the industry, and the favoured position its stocks hold in the opinion of investors. The value of six electric lighting and power shares (having an aggregate capital of £3,180,000) shows an even smaller percentage depreciation.

### An Expression of Dissatisfaction.

One has become so accustomed to seeing and to hearing praise of the resolute manner in which the Government have grasped a particularly troublesome nettle, that it is something in the nature of a surprise to find that the British Engineers' Association (an organization representing manufacturing concerns with a combined capital of over £100,000,000) have issued a special report on trading with the enemy, in which dissatisfaction is expressed with the Government's policy in this matter. It seems that they have received a large number of communications from their members, and from engineering firms outside the Association, complaining of the inadequacy of the Government measure for controlling trade with enemy countries. It is felt that the Act specially passed last month to stop such trading [which was noticed in the "JOURNAL" at the time] does not, in fact, do so completely. The Proclamation under the Act, it is pointed out, permits all people to trade with every German or Austrian—whether naturalized as a British subject or not—residing in Great Britain or elsewhere, except in Germany or Austria, precisely as in normal times. Then, again, the registration of a company in Great Britain, even if the whole of the directors, shareholders, managers, and employees are enemy subjects, puts the company on exactly the same footing as a wholly British company for the purposes of trading. While, also, the Act does not allow any money to be transmitted to enemy countries, it is argued that there is nothing to prevent any German or Austrian agent in this country from evading the prohibition by passing his remittance through a neutral country and getting his goods into Great Britain through the same channel. In the same way, a German or Austrian manufacturing in this country can remit all his profit to shareholders in Germany or Austria. What the Association would like to see would be the terms of the Proclamation so revised that, at all events, certain Germans and Austrians in this country should be classed as enemies—more particularly those who manufacture in Great Britain and those who act as agents for manufacturers in Germany and Austria. The Association have formulated a definition of an "alien enemy" for purposes of trading which would carry into effect their views. This has been placed before the Government, who will doubtless consider it along with the many very pressing matters they have on hand.

---

**Gas from Coal-Mine Refuse.**—According to a United States consular report, the Nanaimo Gas Company have succeeded in manufacturing coal gas of uniform quality from low-grade coal-mine refuse. The process is now established, and has been in daily operation at Nanaimo, British Columbia, during the past six months. The Company have also successfully piped the gas as far as Victoria, 60 miles distant.

**Fire-Clays in Coal Mines.**—In the course of a paper upon "Unknown Clays in Coal Mines," presented at a recent meeting of the Institution of Mining Engineers at Stoke-on-Trent, by Dr. J. W. Mellor, he referred to the assertion of geologists that the North Staffordshire district is an exceedingly promising place to look for good fire-clays, and remarked: "There are certainly indications that in the coal mines one or more good fire-clays are being passed by as useless, which if brought to the surface would be as valuable as, or more valuable than, coal. The simultaneous mining of coals and fire-clay is no new matter. There are coal mines which bring up coal and clay simultaneously; and there are exhausted coal mines which are being reworked for fire-clay. So far as the writer knows, the fire-clays associated with the coal are not mined in this district. Why? If it be certain that all the clays passed by are of an inferior grade, the answer is obvious; but, so far as he has been able to ascertain, the true answer is that no one has given the subject much attention. Preliminary tests on a very small number of samples from local mines have been very satisfactory. Most of the fire-clays which crop out in the local surface mines, and are used in making saggers and fire-bricks, would be classed as second-grade fire-clays, and some would not be called fire-clays at all, if judged by the standards adopted in some of the industries.

## PERSONAL.

Mr. GEORGE HOLLAND has resigned the position of Gas Manager to the Sanquhar Corporation, on obtaining a similar post under the Dreghorn Gas Company.

Mr. MARTIN TRACY, of the Carrick-on-Suir Gas-Works, will replace Mr. WILLIAM EWING at the Wicklow Gas-Works. Mr. EWING is going as Manager of the Magherafelt Gas-Works.

Mr. W. H. ELLIS, a Director of Messrs. John Brown and Co., and head of their Sheffield works, was last week installed as Master Cutler of Sheffield. Colonel A. E. Bingham and Colonel H. K. Stephenson are respectively Senior and Junior Wardens.

Mr. CECIL RHODES ARMITAGE, the Gas Engineer to the Lancaster Corporation, and son of Mr. Charles Armitage, has been married to Miss ELEANOR SCHOFIELD, the daughter of Mrs. James Mortimer and the late Mr. Charles Douglas Schofield, of Bradford.

In view of the relinquishment by Mr. GEORGE KEILLOR of the position of Gas Engineer and Manager to the Broughty Ferry Corporation, in order to take charge of the tar-distillation works of the Dundee Corporation now under construction, a gathering of his friends took place last Tuesday night, when he was presented with a cheque for £23 10s., together with a gold wristlet watch and bracelet for Mrs. Keillor. After the presentation the company were entertained at dinner by Mr. and Mrs. Keillor.

The position of Assistant-Engineer to the Rugby Gas Company, applications for which were asked in an advertisement appearing in the "JOURNAL" for the 8th ult., has been filled by the appointment of Mr. ERNEST SCEARS, Assistant to Mr. W. E. Price, at the Hampton Court Gas-Works. Keen regret at losing him will be mingled with the congratulations on his new appointment by members of the London and Southern District Junior Gas Association, of which Mr. Scears was for several years Hon. Secretary. Some months ago he gave up the secretaryship, and was last May elected Senior Vice-President.

From the report elsewhere to-day of the proceedings at the meeting of the Alliance and Dublin Consumers' Gas Company, it will be seen that Mr. W. F. COTTON, the Engineer, has resigned his appointment; and since the meeting, the information has been received that the Secretary and Manager, Mr. FRANCIS T. COTTON, has also given up his position. As is well known, Mr. WILLIAM NEWBIGGING is now acting as Consulting Engineer to the Company; and Mr. W. J. GREY, A.C.A., has been appointed Secretary and Accountant. This last-named gentleman has been a member of the technical staff of Messrs. Cash, Stone, and Co., of No. 90, Cannon Street, London; and in view of the large claim that there is upon the services of Mr. Cash in connection with the finances of gas undertakings, Mr. Grey has had a considerable and varied experience in connection with gas accounts, and the work generally of the secretarial and accountancy department of a gas undertaking. Readers may be reminded that Mr. F. T. Cotton was appointed Assistant Secretary and Manager to the Company, vacant by the death of Mr. J. J. Cotton early in 1897; and in the autumn of the following year he was entrusted with the Secretaryship, on the resignation by Mr. W. F. Cotton, sen., of the positions of Secretary and General Manager, when he was placed on the Board as Managing-Director. In September, 1903, Mr. F. T. Cotton was appointed Manager as well as Secretary. We may add that Mr. Grey is an Associate of the Institute of Chartered Accountants in England and Wales, and was admitted, after passing his Final Examination, in February, 1910. It will doubtless be remembered that in the report of the Company for the half year ended the 30th of June the Directors stated that the accounts had been placed in the hands of Messrs. Cash, Stone, and Co., for investigation and adjustment; and we understand that this work, on behalf of the firm, was largely done by Mr. Grey.

### The War and the Sulphate Market.

Supplementing the article on "Synthetic Ammonia," in last week's "JOURNAL" [p. 721], it may be pointed out that an indirect effect of the war on the sulphate market, which must inevitably be felt before long, is due to the present prodigious demand for explosives by the combatants. Nitric acid is required directly or indirectly in the manufacture of all the more important modern explosives; and the production of the immense quantities of nitric acid now consumed by explosives works must withdraw from the fertilizer market a considerable quantity of nitrate of soda and other nitrates. The nitrates of which agriculture is thus deprived of its normal supply can only be conveniently and economically replaced by sulphate of ammonia. On this account, also, there is good ground for anticipating an improvement in the demand for sulphate.

**Midland Junior Gas Association.**—We have received the "Transactions" of this Association for the ninth session—1913-14. The pamphlet contains the papers and discussions at the various meetings and the accounts of the visits to works, as well as to the National Gas Exhibition, reprinted from the "JOURNAL." The technical matter is preceded by a list of the officers, council, and honorary members.

## PRESENTATION TO MR. S. O. STEPHENSON.

THE Manager of the Tipton Gas-Works (Mr. S. O. Stephenson) has been the recipient of a handsome present from the District Council, upon his leaving on Saturday to take up the position of Engineer and General Manager of the Worthing Gas Company, after thirteen years' service. The presentation consisted of an illuminated address in a handsome gilt frame, which was handed to him by the Chairman of the Council (Mr. T. E. Salter). The address was as follows:

To S. O. Stephenson, Esq.

We, the members of the Tipton Urban District Council, desire to place on record our appreciation of your services during the past thirteen years as Engineer and Manager of the Gas Department of the above Council. We have observed with great satisfaction the unstinted amount of energy you have displayed, and the manner in which you have carried out the various improvements. Under your control and management the works have been highly successful; the output rising steadily from 98 million cubic feet of gas to 149 million cubic feet—thus proving your ability to negotiate with, and retain the confidence of, the consumers. The erection of the new vertical retorts under your personal direction and supervision is a marked success. Whilst we much regret to lose your services, we most heartily extend to you our congratulations on your appointment as Engineer and Manager of the Worthing Gaslight and Coke Company, and express the hope that you may be spared for many years to come, and that your future career may be one of continued prosperity.

The names at the foot of the address were of the Chairman of the Council, the Chairman of the Gas Committee, and the other members of the Council and officials.

Mr. SALTER, in handing the address to Mr. Stephenson, said he would leave behind him the memory of a capable Gas Manager and Engineer, and also the memory of a man of character.

Mr. ROBBINS (the Chairman of the Gas Committee) added a few words, remarking that they had been through some trying and troublesome times at their gas-works, but Mr. Stephenson had never failed them.

Mr. STEPHENSON, in reply, said the intrinsic value of the present was nothing compared with the expression of good feeling that it indicated. It would be a big wrench to leave so many good friends at Tipton. He hoped the support which had been given to him would be extended to his successor.

## DEATH OF MR. STEPHEN HOLMAN.

THE death occurred last Tuesday, at the advanced age of eighty-seven, of Mr. Stephen Holman, whose name is known in the gas industry all over the world in connection with his improvements in the method of sealing retort-lids. About this time last year Mr. Holman was seen by many of his friends at the National Gas Exhibition; and he called at the "JOURNAL" office early in the present year, when he appeared to be in good health and very active for his age. His death followed a sudden breakdown.

Mr. Holman had a long career in the engineering world—beginning in 1841, when (preparatory to his apprenticeship) he was placed as an assistant in connection with the pumping plant at a Cornish mine. Between 1854 and 1882, he took out no less than eighteen patents; and his latest one, taken out early this year, was described and illustrated in the "JOURNAL" for the 24th of March. In 1862, he rented offices in Cannon Street, and represented several well-known English firms—among them Messrs. Tangye Bros., of Birmingham. Five years later, this agency merged into a partnership, under the title of Tangye Brothers and Holman. Before patenting his retort-lid fastenings, Mr. Holman had had charge of a gas-works, and had foreseen the value of non-luted lids, if they were successful. He therefore entered into an agreement with the late Mr. Robert Morton for the sole manufacture of his non-luted lids, and took out patents for fastenings for them. The combined working of mechanical stokers, self-sealing retort-lids, and double eccentric lever fastenings has made it possible to discharge and re-charge sixty retorts per hour, which would be impracticable with luted lids and manual stoking. An approximate estimate of the saving to gas undertakings by the use of modern non-luted lids was given in a circular issued some time back by Mr. Morton—namely, £50 a week in a retort-house containing 250 through retorts. He further calculated that the aggregate saving to undertakings by using Morton's lids with Holman's fastenings exceeded £1,000,000 per annum.

About two years ago it was ascertained that Mr. Holman had not had his reward in the shape of royalties from the users of his three well-known patents in connection with Morton's self-sealing gas-retort lids, nor had he participated in the profits accruing to the various British and foreign makers of his inventions upon whom he had had no claim for royalty, because the term of his patents expired in 1888, and his business income ceased on the termination of his partnership a quarter-of-a-century ago. A movement was accordingly set on foot to make a presentation to him in recognition of the great services he had rendered to gas undertakings. A generous response was made to an appeal for subscriptions; and Mr. Holman received an appreciative tribute in the shape of a sum of money and a life-size portrait in oils.

## THE GAS INDUSTRY AND THE WAR.

We learn that Mr. F. J. Bywater, the Resident Engineer of the East Greenwich Station of the South Metropolitan Gas Company, has joined as an officer the Sixth City of London Rifles. Some hundreds of the Company's employees are in the same battalion. The exact figure we do not know; but at all events it forms a very large percentage of the 1200 or so of the Company's men who have joined the Forces in one capacity or another (including reservists, territorials, ambulance men, &c.). Thus Mr. Bywater is with men a lot of whom know him. Another of the Company's officers, Mr. E. Stokes, is Major of the same battalion. Mr. A. F. Browne, of Vauxhall, is in charge of the East Greenwich works during Mr. Bywater's absence.

Mr. R. S. Hilton, the Secretary and Manager of the Gas Department, is acting as Hon. Secretary to the Equipment Committee formed in connection with the raising of the City Battalions in Birmingham.

Private E. T. Kings, of the Second Royal Irish Regiment, who prior to the war was employed at the King's Norton governor-house, has contributed to the "City of Birmingham Gas Department Magazine" an exciting account of his experiences at the Battle of Mons. He was invalided home to Brighton, and on his discharge from hospital there returned to Birmingham, prior to leaving for the Clonmel Depôt. Mr. Kings, in the course of his narrative, says: "I did not get a scratch during the four days' fighting, but was picked out of the trenches at 3 o'clock on the morning of Aug. 27 suffering from hæmorrhage. A very funny thing happened here. I was placed on a lorry belonging to the South Metropolitan Gas Company, which had the price of their coke in big figures on the side. In this I was taken to hospital, and then sent down country to Amiens in a motor lorry. From here we went by train to Rouen, and then to Southampton."

Mr. A. G. Cloake, of Holborn Viaduct, E.C., forwards the gratifying information that the important works of La Société du Familistere de Guise (Colin and Co.), who are well known in England on account of the fine quality of their iron castings, have escaped destruction, though the town of Guise itself, which is situated in the Aisne Department of France, was taken and retaken by the enemy after heavy bombardments, and is reported to be entirely devastated. All offices, show-rooms, and available warehouses in the Familistere have been transformed into hospitals. The firm's works in Brussels are intact, but have been closed since the Germans entered the town. Mr. Cloake sends some capital picture post-cards, which give a very fair idea of the importance of the works at Guise.

At to-morrow's meeting of the Manchester City Council, Mr. Ross Clyne, one of the members of the Gas Committee, will move a resolution to the effect that, in consequence of the abnormal expense to which the city is put by reason of the war, the diminution of revenue caused thereby, and "the greater financial burden on the crippled resources of the ratepayers," the Officials' (Conditions of Service) Special Committee immediately take into consideration the question of the remuneration of all Corporation employees, with a view to adopting an equitable reduction during the period of the war.

A month ago, the total number of men in the Birmingham Corporation Gas Department on military duty was 174; but this figure has since been increased to 464. A statement was made in the "JOURNAL" for Sept. 8 [p. 558] as to how the men would be treated as regards their wages or salary while they were away. Subsequently the Council reconsidered the matter, and unanimously resolved that officers or servants of the Corporation who joined the forces should be reinstated on return without loss of position or emoluments, and that the Corporation pay them such sums as, with the allowances received from Government, would make up their full salaries or wages. This applies to all, whether married or single.

A meeting of the Chairmen and Deputy-Chairmen of the various Corporation Committees was held at the Manchester Town Hall on Friday, to deal with the question of payment to all Corporation employees (including the gas and water departments) who have joined the Army and Navy. A resolution was originally passed with regard to half-pay; and the Council, at the last meeting, affirmed the principle that no man should be financially worse off as a consequence of joining the forces. Our Manchester correspondent is informed that the method has worked out in contrary ways; and the Committee have now decided that the half-pay system should apply, and in any case the difference between Army and Navy pay and the salary earned at the time of enlistment will be made up by the Corporation.

At the meeting of the Leamington Priors Gas Company last Tuesday, the Chairman (Alderman T. W. Thursfield, M.D.) stated that about twenty of the men had joined the Army, and the Company were making grants to the wives, and giving a large grant in cases where there were children. The Directors had written to the Mayor making a donation of 100 tons of coke to be delivered in half-ton lots at the houses of those to whom the Relief Committee decide to make the allowance.

Mr. Edward Wright, one of the Directors of the Leamington Priors Gas Company, headed the Mayor's subscription list to the Prince of Wales's Fund with a donation of £1000.

At Rochdale recently, Professor Weiss (a Yorkshireman, by the way), of Manchester University, said that, if he had been speaking before the outbreak of war, he should have said that England had more to fear from German technical education than German "Dreadnoughts." Perhaps he could not say this now. German education had, however, taken more of our commerce than their "Dreadnoughts" were likely to take. The advantage which Germany had enjoyed was not due to better workmen and more ingenuity, but to the fact that they started technical education earlier than England. The outcome of the war would be settled largely by the power of our being able to maintain our industries, while Germany would be unable to maintain hers. It was of importance that this country should strive to secure some of Germany's trade; but what was of greater importance was that they must keep it after peace had been declared. To do this, we must train our workmen to be more efficient.

In the course of his lecture at the Manchester University on Saturday, Mr. W. Noble Twelvetrees showed several views illustrating various kinds of structures—purification houses, reservoirs, granaries, tramway sheds, and even a Schneider *caisson* used for testing torpedoes—of reinforced concrete erected in France and Belgium. The appearance on the screen of a Belgian chimney stack was the signal for sympathetic applause, and the Mons tramway-sheds also received due recognition.

Among the additional contributions received by the Lord Provost of Glasgow to the Prince of Wales's Fund is a sum of £107 5s. from the staff and employees of the Lighting Department. It is entered as a "first contribution." Referring to the matter, the "Glasgow News," in a paragraph headed "The Lamplighter's Pound," said: "Among the contributors to the National Relief Fund, few sections of the Corporation have excelled the voluntary effort of the Lighting Department. Out of a total strength of nearly 1000 employees, no less than 2140 shillings have been contributed—or fully 2s. per head. The ratio suggested was a sum equal to a day's pay; so it will be seen that the staff, which includes the stair lighters—perhaps the lowest-paid class in the Corporation service—has done exceedingly well. One of the stair lighters sent in a £1 note as his contribution."

Several men from the Tipton Gas Department have joined the Army; and at a meeting of the District Council it was recommended that, in the case of married men, 10s. per week be allowed to their wives, and in the case of single men 5s. per week be allowed to their dependants. It was stated that no married men had yet left the Tipton Gas-Works for the front, and Mr. Robbins (the Chairman of the Gas Committee) said that, as employers, it was their duty to set an example in this national crisis. The recommendation was referred back for reconsideration at the next meeting of the Gas Committee.

The British Aluminium Company, Limited, who are the principal producers of aluminium in Great Britain, have arranged for the release of a considerable number of their staff and employees, who have answered the country's call to the Colours. Up to the present, 453 men—equivalent to 20 per cent. of the Company's employees—have joined the forces. At the Kinlochleven, Larne, and Milton works, and at the head office, the response has been both prompt and enthusiastic; some 40 per cent. of the total employees at Kinlochleven alone having volunteered, which includes practically all those who are eligible. In addition to this, about 200 of the men employed at the Company's Milton (North Staffs.) rolling mills are being drilled nightly by their mates who happen to be old soldiers; and both here and at Larne more men are joining daily. The places of those who have been called up are being kept open pending their return; temporary arrangements being made in the meantime by drawing men from industries which are slack during the war, or from those who are otherwise unfit for service. Financial provision is being made for the staff in accordance with their responsibilities; and the families of all married employees serving with the Colours, or others dependent upon them, are being paid 10s. per week, those residing on the Company's premises doing so rent free for the present.

One must hope, and believe, that it was an altogether exceptional state of affairs which was revealed at Walsall Police Court last week, when cases were heard in which Messrs. John Russell and Co., Limited, of the Cyclops Iron Works, claimed—and obtained—damages from two employees for neglect of work. A third man had also been summoned, but he had, prior to the hearing, agreed to pay the amount claimed. It was stated on behalf of the firm that they had lost about a hundred workmen, who had joined His Majesty's forces; and a notice had been put up in the works to the effect that they were prepared to help the wives and families of any of the employees who went to the front. Apparently, however, the patriotism of some of the workmen at Walsall was hard to discover, as the firm's employees said that if Messrs. Russell and Co. could afford to help dependants

of the men who were on active service, they could afford to pay the workmen who were left behind more money. The result was that the firm had suffered great loss owing to the men going off drinking and neglecting their work.

---

Fears having been expressed in various quarters that much of the coal shipped to Holland since the start of the war might be finding its way into Germany, Mr. George Dunston, of Hull, has addressed a letter on the subject to the Press. In this he says there is no ground for any such fear, as the authorities in Holland have complete control of all English coal coming into the country. As a matter of fact, he adds, the greater part of the coal now exported to Holland consists of supplies for use in Dutch gas-works. As there are about 150 of these works, a large quantity of coal is required to keep them going. Bearing on this statement, a report appeared in the London papers subsequent to the publication of the letter, to the effect that the steamship "Selby," of West Hartlepool, had gone down in the North Sea, in consequence of striking a mine. This boat, it appears, was bound from Shields to Antwerp, with 3000 tons of gas coal.

---

In view of the title of the firm (which has led some customers to make inquiries as to their position), Messrs. Falk, Stadelmann, and Co., Limited, have issued an explanatory circular. This they think may reassure clients, and "at the same time put an end to malicious statements which they understand are being circulated." It is pointed out by the firm that the business was established in 1881, and was incorporated as a Limited Liability Company in the year 1887, on quite a small scale. But progress has been such that to-day the total capital is £392,790. All the Directors are British subjects, as are also all the shareholders, with the single exception of one of the founders, whose holding of ordinary shares is only £28,080. The Company have a staff of upwards of 1500 British employees, apart from the great number indirectly dependent upon their trading, as it has always been the policy of the Company to encourage British manufactures to the fullest possible extent. The many publications issued show the large range of "British-made" lines for which the Company have established a considerable demand throughout the lighting industry. Goods of foreign manufacture represent only about 25 per cent. of the Company's business, and consist of raw material or articles not previously produced in this country on a commercial scale. The outbreak of the war, however, has provided the opportunity to manufacture at home a number of lines hitherto imported; and they have made arrangements to do this wherever possible. Every encouragement and facility has been given to those of the staff who are eligible to join His Majesty's Forces, and about 100 have enlisted for the period of the war, during which time their posts will be kept open, and liberal provision made for their dependants. No dismissals have been made from the staff, nor is such a step intended; and during the war the Company will make every sacrifice to keep going the various works in which they are interested, as also to continue with the erection of large branch warehouses in Manchester commenced before the crisis.

---

Mr. Charles H. Luke, of No. 104, High Holborn, W.C. (Joint Manager and Secretary of the Shipping, Engineering, and Machinery Exhibition), writes a letter in which he says he thinks he represents the views of a large section of British industry, when he asserts that British firms will not get the assistance to which it is entitled in the work of capturing German and Austrian trade under the Board of Trade as at present constituted. He suggests the setting-up in place of the Board of several Departments, under a Minister of Commerce, a Minister of Railways and Marine, and a Minister of Labour—not necessarily members of any Party, but chosen solely by merit. In his opinion, these three Ministries would cover the whole of the work entrusted to the Board of Trade, and if efficiently organized would do it much better. He continues: "Every thoughtful Englishman must believe that on the action now taken will depend the future of the British Empire. Now is the time to take what is best from the collective German organization of commerce, and graft it on to our individualism—thus forging an irresistible weapon for the Nation. This can only be done, in my opinion, by the co-operation of three factors: (1) By British firms being willing to drop antiquated methods and seize the opportunity with both hands. (2) By the adoption, under compulsion or otherwise, of a National policy on the part of our great joint-stock banks, or, if it is impossible to make business men of the controllers of our banking institutions, by the formation of State-aided banks of commerce, whose main duty is not to avoid assisting their clients, but rather to meet halfway those requiring financial facilities for legitimate business enterprises. (3) By a thoroughly business policy on the part of the Government, which could quickly show itself in two most needed reforms—(*a*) the selection of men as Ambassadors and Ministers to foreign countries who have some business aptitude as well as diplomatic experience, and the appointment of Commercial Attachés who shall in all cases be trained business men; and (*b*) the appointment of trained business men as Consul-Generals and Consuls in all important centres of trade, and the abandoning entirely of the policy of appointing foreigners as Consuls and Vice-Consuls in order to save a few thousand pounds per annum. If something is not done now, the whole matter is likely to be shelved, and we shall continue the usual policy of muddling along."

## GAS ACTS FOR 1914.

[SECOND ARTICLE.]

THE review of the new Acts of gas companies who entered upon the parliamentary session as statutory concerns may now be taken in hand. Of the sixteen Bills that were lodged, only one has fallen by the way—that of the Alliance and Dublin Consumers' Gas Company, which was introduced for the purpose of securing electricity powers for certain outlying areas. The group of Acts noticed to-day had their original Bills outlined in the issue of the "JOURNAL" for Jan. 13 last; and in the main attention will now only be devoted to the alterations made during the journey through Parliament.

The voluminous Act of the Brentford Gas Company falls first for notice. The capital consolidation scheme has gone through. From Jan. 1 next the consolidated stock authorized by the Acts of 1858 and 1868, amounting to £380,000, is to be converted into £950,000 stock, to be called "A" consolidated stock, and the new 1881 stock, amounting to £330,000 (being part of the £750,000 new stock authorized by the Company's Order of 1881), is to be converted into £660,000 of "B" consolidated stock. The Company have an existing power to create and issue new 1881 stock to the amount of £220,940; and this is now to be deemed to be a power to create and issue "B" consolidated stock to the amount of £310,000. If considered advisable, the Company may issue this £310,000 as new preference stock. The Company are invested with power to borrow up to one-third part of the nominal amount of the capital. A provision authorizes the cancellation of the share number 555 of the nominal value of £50 of the original capital authorized by the Act 1 and 2 George IV. cap. 69 (local), and now represented by £78 of consolidated stock authorized in 1858. The Directors have removed from them the obligation to prepare half-yearly accounts, or to hold ordinary meetings more than once a year. Dividends, standard price, and sliding-scale are all as when the Bill was under review; and so, in relation to the transfer of the Staines and Sunbury Gas Companies, are the terms for the exchange of stock, together with the power to create the necessary stock. The unexercised capital authorization of the two Companies is transferred to the Brentford Company. The Directors of the Staines Company are to receive as compensation the equivalent of seven years' purchase of the gross amount of their fees; and the Directors of the Sunbury Company, such a sum as may be agreed upon. Each Auditor is to receive a sum equal to three years' remuneration. In respect of the officers of ten years' service and upwards who are not taken over, the compensation is to be determined by agreement or arbitration. The original scheme as to the charges for gas in the Staines and Sunbury districts stands good. With regard to the extension of the limits of supply and a proposed extinction of certain supply powers of the Uxbridge Gas Company, the position now is that the limits of the Brentford Company are to be extended to include the parish of Laleham, and they are given the right to lay a through main in the portion of the road leading from Staines to East Bedfont in the parish of Stanwell and within the limits of supply of the Uxbridge Company, "provided that nothing in this section shall authorize the Company to supply gas from so much of such main or mains as is laid in the portion aforesaid of the Staines Road in the parish of Stanwell within the limits of supply of the Uxbridge Company." The Metropolitan Water Board and the Great Western Railway have secured certain protective clauses. An important change since the Bill was introduced has been the suppression of the illuminating power standard and the setting-up of calorific value testing for penalty purposes and flat-flame testing for information only. So long as the Company supply gas from the Staines and Sunbury works, they are to maintain the existing testing-places provided by the two Companies, and are at all times to fully maintain two places for testing "all gas manufactured at, and supplied from, the works of the Company other than the works at Staines and Sunbury." The calorific clauses follow the conditions of the Gas Light and Coke Company—540 B.Th.U. (total heat value), with penalties commencing at 7½ per cent. below the standard, with (if the first test is below the penalty line) an average of two testings in one day. The penalties are on these lines: Where the deficiency does not exceed 14 B.Th.U., £5; where the deficiency exceeds 14 B.Th.U., but does not amount to 28 B.Th.U., a sum not exceeding £10; and for each 28 B.Th.U., a sum not exceeding £20. The proposed new works site clause has altogether disappeared. Then follow the much discussed powers to apply for a Provisional Order authorizing the supply of electricity, to acquire by agreement the electricity undertakings of local authorities and others, and to use land and funds for electricity purposes. The powers conferred upon the Company by this part of the Act are not to be exercised within the Administrative County of London. Section 34 of the Act of 1868, relative to the charges for gas supplied to public lamps, has had inserted in it the words "for gas supplied for lighting purposes;" the proviso being attached "that the price to be charged for gas supplied to public lamps shall bear the same proportion to the price by which the rate of dividend is determined as at the date of the passing of this Act." The power gas supply authorization has been limited to this: "The Company may by agreement with the occupier of

any premises within a radius of one-half of a mile from any land on which the Company are authorized to manufacture gas, supply gas to such premises for utilization as power"—the clauses applying to the ordinary gas supply being excepted. The other clauses as to the supply of power gas are of customary form. A large number of miscellaneous clauses are included, embracing a stand-by one. [*Parliamentary Agent: Mr. John Kennedy.*]

In the British Gaslight Company's Act, we see there has been a reduction made in the amount of capital sought for. As the Bill was not opposed in Parliament, this was doubtless arranged with the Hull Corporation. The Company asked for power to spend £400,000 extra, of which £300,000 might be expended out of the capital stock of the Company, while there might be borrowed on mortgage in respect of the further capital sums not exceeding in the whole £100,000. What has happened is that authorization is given to the expenditure of £300,000 beyond the £600,000 already authorized. The expenditure out of the capital stock is limited to £225,000, and the borrowing on mortgage in respect of such further capital to £75,000. The profits that may be divided on the £225,000 are limited to 5½ per cent., and on the amount borrowed on mortgage to 4½ per cent. The Company are expressly forbidden to convert the £75,000 into either shares or stock. No other alteration has been made. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

The Deal and Walmer Gas Company having obtained electricity powers, are going to elongate their title by the insertion of the words "and Electricity." The limits of supply for electricity are Deal, Walmer, and the parish of Ringwould. Within three months after the passing of the Act, the Company are to pay to the Sandwich, Deal, and Walmer Electricity Supply Company, Limited, the sum of £1100, and the latter are on their part to deliver to the purchasers all the plans and specifications prepared by the engineers for carrying into effect the Order of 1911. The Company are before Dec. 1, 1916, to lay down sufficient distributing mains for the purpose of a general supply of electricity throughout the streets mentioned in the second schedule to the Act; but there is a conditional arrangement by which the period can be extended to three years from the passing of the Act. If at the expiration of five years, the Company have not laid down distributing mains for the purpose of a general supply of electricity in Ringwould, the Board of Trade may order the powers to cease. The Company are not to exercise the electricity powers before Dec. 1 next. The object of this is to give the Deal and Walmer authorities an opportunity of promoting a Bill or Orders for a scheme of electricity supply; and then the Company are not to exercise their present powers unless the Bill or the Orders fail to pass into law. The East Kent Light Railways Company, the South-Eastern and Chatham Railways Managing Committee, and the Postmaster-General have all secured protective clauses. The provision extending the limits of gas supply has disappeared, and so has the one referring to trading in power gas. The clauses as to the price of gas, quality, lands, works, railway sidings, capital, dividends, standard price, benefit and pension funds, and profit-sharing scheme are as when the Bill was under review on Jan. 13. The special purposes fund provisions, in accordance with the new model clause, put upon the Board of Trade the duty of appointing an accountant. There is really nothing further that is fresh calling for notice. [*Parliamentary Agents: Messrs. Rees and Freres.*]

The Gas Light and Coke Company's Act, over which the calorific power question was fought, and which serves as the model, falls next in alphabetical rotation. The illuminating power standard and test and the old calorific clauses under which the Company have been working are revoked; and in lieu thereof we have the following main provisions:

> The standard calorific power of the gas supplied by the Company in any part of their area of supply shall be 540 B.Th.U. Provided that the Company shall not be liable to any penalty or proceedings for, or in respect of, any deficiency in the calorific power of the gas supplied by them, except under, and in accordance with, the express provisions of this Act;
>
> One testing only for calorific power shall be made at each testing-place daily; but in the event of the calorific power being on any testing ascertained to be below the standard calorific power to an extent exceeding 7½ per cent., the gas examiner shall forthwith give notice thereof to the Company and a second testing shall be made at an interval of not less than one hour from the time of making the first testing at that testing-place, and the average of the two testings shall be deemed to be the calorific power of the gas at such testing-place on that day.
>
> Section 42 (Power to Board of Trade to Vary Standard Calorific Power) of the Act of 1909 shall be read and construed accordingly.
>
> The apparatus to be prescribed by the Gas Referees for testing the calorific power of the gas supplied by the Company shall be the most suitable for ascertaining, and in making the test shall be used in such a manner, and under such conditions, as to ascertain, after any necessary calculations have been made, the total heat value of the gas.

With regard to forfeitures, the following apply to the old area of the Company:

> The Company shall not be liable to any forfeiture for defective calorific power where the calorific power on any day of the gas supplied by them is not below the standard calorific power to an extent exceeding 7½ per cent.; but where the calorific power on any day of such gas is below the standard calorific power to an extent exceeding 7½ per cent., the Company shall be liable to the following forfeitures in respect of any deficiency beyond such last-mentioned margin (that is to say).
>
> Where the deficiency does not exceed 14 B.Th.U., £5.
>
> Where the deficiency exceeds 14 B.Th.U., but does not amount to 28 B.Th.U., a sum not exceeding £10.
>
> For each complete 28 B.Th.U. of defective power, a sum not less than £25, and not exceeding £100.
>
> Provided always that the controlling authority of any testing-place having recovered one forfeiture in respect of defective calorific power in the gas supplied by the Company at one testing-place on any day shall not be entitled to any further forfeiture in respect of defective calorific power in the gas supplied by the Company at any other testing-place of such controlling authority on the same day. Provided also that no forfeiture shall be incurred in any case with respect to which it is certified by the Chief Gas Examiner that the defect of calorific power was occasioned by an unavoidable cause or accident.

The forfeiture clauses applying to the West Ham district are the same for deficiencies not exceeding 14 B.Th.U. and for deficiencies exceeding 14 and not exceeding 28 B.Th.U.; but for each complete 28 B.Th.U., the penalty is not to exceed £20. [The penalties are not so heavy for smaller companies—see Sept. 29, p. 707]. The calorific clauses with the provisions special to the West Ham area are applied to the Barking and Chigwell districts. If required by any consumer, the Company are (within the next two years) to supply and fix free of charge flat-flame burners suitable to the quality of the gas prescribed, in substitution for any flat-flame burners in use by such consumer. Regarding prepayment consumers, there is provision for fixing an incandescent burner in the following terms:

> The Company shall, at any time within two years after the appointed day, if and when required by any consumer of gas supplied by the Company upon the appointed day [Jan. 1 next] by means of a prepayment meter upon whose premises no incandescent burner shall have been fixed before the appointed day, supply to such consumer, and fix free of charge, one incandescent burner suitable in all respects for the consumption of gas of the quality prescribed by this Act in exchange for such one of the flat-flame burners in use by such consumer upon such premises before the appointed day as he may select.

Succeeding are provisions referring to testing illuminating power with flat-flame burners in West Ham, East Ham, and Leyton, for information purposes. By a subsequent clause, it is stipulated that "this Act shall not, by reason only of the enactment of the provisions thereof, confer any exemption from any general legislation relating to the supply of gas which may be passed in this or any future session of Parliament; but the provisions of this section shall not be construed as preventing the conferring of any such exemption or the enactment in any such general legislation of any special provisions relating to the undertaking of the Company."—[*Parliamentary Agents: Messrs. Dyson and Co.*]

In the Hayward's Heath Company's Act, all we stated when [on Jan. 13] summarizing the Bill as introduced, holds good concerning the extension of the limits of supply and the positions of the Cuckfield Gas Company and the Cuckfield District Council; and so there is no necessity to repeat the information. The Balcombe Gas Company have been granted protection. If, and so long as, that Company supply petrol gas under the provisions of their Order, the price to be charged by the Hayward's Heath Company for gas supplied by them to consumers in the parish is to be equal to the highest price for the time being charged by them for gas supplied for similar purposes within the area of which the part of the parish in question is situate; or if no gas is being supplied within such area other than the gas supplied within the parish, then the maximum price to which the Company are entitled for the time being under the provisions of the Act in the area in question is to be charged. The gas is not to be supplied on terms or subject to conditions more favourable than those obtaining in the inner area, either as to the supply of meters, fittings, or otherwise. If the Balcombe Gas Company give to the Hayward's Heath Gas Company notice, within one year after the passing of the Act, that they require them to purchase their property, the Company are to do so on the expiration of one month, at cost price, less depreciation (if any). In the event of dispute, recourse may be had to arbitration. The clauses alluding to the conversion of capital, to the new capital powers, and to benefit and pension funds are the same as when the Bill was formerly noticed. In the special purposes fund, the Board of Trade have now imposed upon them the duty of appointing an Auditor. In reference to the prices of gas, there are some changes in the conditions. In the "inner area" the standard price is to be 4s. 9d., instead of 5s. The prices to be charged for gas within the limits of supply other than the inner area are not to exceed the price for the time being charged within that area by more than 6d. in the middle area, and by more than 1s. in the outer area. There are no other noticeable changes until we come to the clauses protecting the County Council of East Sussex, the first provision of which stipulates that all mains, pipes, &c., laid after the passing of the Act in any main road or over a main road bridge "shall be laid in such position in, or at the side thereof, and at such depth, or carried on the outside or below the structure, of any such bridge in such manner as the County Council in writing under the hand of their county surveyor may reasonably direct." The Cuckfield Rural District Council also have a number of provisions in their favour, one of which frees them from liability in respect of any damage due to any gas-mains of the

Company laid, after the passing of the Act, with less cover than 2 ft. 6 in. in the case of cast-iron pipes and 1 ft. 6 in. in the case of wrought-iron or steel pipes, "where such injury arises from the use by the Council of any steam or other roller, scarifier, or similar appliance not exceeding in any case 15 tons in weight for the repair of such street, road, or bridge, or of any traction-engine not exceeding 15 tons in weight belonging to the Council." We get a similar clause in the provisions protecting the Hayward's Heath District Council; but the cover in their case is to be 2 feet for wrought-iron and steel mains. Exemption from liability for injury arising from the use of a 15-ton roller is asking too much. The London, Brighton, and South-Coast Railway Company have also secured certain powers for safeguarding their interests. [*Parliamentary Agents: Messrs. Rees and Freres.*]

The Isle of Thanet Gas Company's Act has shrunk considerably from the dimensions it had when the Bill was introduced. This is due to the excision from the Bill of all the main part relating to the fusion of the Broadstairs Gas Company with Margate. Thus there is very little left to notice. The Company are authorized to raise £100,000 of additional capital; but they are not to create and issue any additional capital under the powers of this Act until they have exercised the whole of their borrowing powers under their various Acts. The additional capital will carry the usual one-third borrowing powers. In the special purposes fund the duty of appointing an accountant is delegated to the Board of Trade, in compliance with the absurd new model clause. Power is given for the acquisition of lands for gas-works purposes; but within three months from the passing of the Act, the Company are to convey to the Broadstairs Company a specified piece at a price equal to the average price per acre paid by the Company. When the Company remove their manufacturing operations to the new works, they are to provide a testing-place in such position in the borough of Margate as may be reasonably approved by the Corporation; but the existing testing-place is the prescribed one for the time being, The calorific clauses (together with the flat-flame testing for information only) follow the lines of the Gas Light and Coke ones. In regard to forfeitures, there is no reference to a deficiency of 14 B.Th.U.; but the penalties are to be: When the deficiency does not amount to 28 B.Th.U., a sum not exceeding £5; and for each complete 28 B.Th.U. of defective calorific power, a sum not exceeding £10. The minimum pressure of gas is to be not less than 2 inches. Regarding the price of gas supplied to the public lamps, it is to be 5 per cent. less than the lowest price charged for the time being for gas supplied to private consumers for lighting purposes, "provided that the estimated rate of consumption of the types of burner in use for public lighting at the time of the passing of this Act shall not be increased; and if any other types of burner shall be substituted therefor, the rate of consumption of the substituted burners shall be estimated in the same proportion as the capacities of those burners bear to the capacities of the burners for which they may be substituted." Another novelty is the power to levy such charge as the Company think fit for taking the reading of any meter fixed in a house, which is either in whole or in part let furnished, at the request of, and for the convenience of, consumers at times other than the Company's periodical readings —such charges not to exceed the sum of 6d. per reading. There are no other clauses calling for special mention. [*Parliamentary Agents: Messrs. R. W. Cooper and Sons.*]

### Midland Junior Gas Association Programme.

Mr. W. J. Pickering (the Hon. Secretary), in forwarding a copy of the programme for the forthcoming session of the Midland Junior Gas Association, points out that on this occasion it has been decided to hold the first meeting in November. The fixtures are as follows—

| | |
|---|---|
| Nov. | 14.—Presidential Address of Mr. F. J. Ward (Knowle). |
| Dec. | 12.—Paper on "Gas-Heated Hot-Water Appliances," by Mr. W. B. Cobb, of Birmingham. |
| Jan. | 9.—Paper on "Carrying out Constructional Work in Gas-Works," by Mr. F. Gorman, of Saltley (late of Buenos Ayres). |
| Feb. | 13.—Visit to the Richmond Gas Stove and Meter Company, at Warrington. |
| „ | 25.—Evening Lecture by Dr. W. B. Davidson, of Birmingham. |
| March | 13.—Paper on "Compressing Installations," by Mr. R. G. Marsh, of Birmingham. |
| „ | 27.—Visit to the Sutherland Meter Company, at Witton. |
| April | 10.—Annual General Meeting. |
| „ | 24.—Visit (to be arranged). |
| May | 8.—Visit to the Knowle and Solihull Gas-Works. |

A well-known citizen of Turriff passed away in the person of Mr. JOHN L. KEITH, who was connected with many of the local organizations. He was Manager of the Gas Company, and a member of the Town Council—holding the Convenership of the Water Committee.

A requisition is to be signed by the members of the Heywood Town Council and presented to Alderman Richard Grundy, asking him to be Mayor of the borough for the ensuing year. He has been a member of the Council since 1896, is Vice-Chairman of the Health Committee, and also a member of the Heywood and Middleton Water Board.

## ELECTRICITY SUPPLY MEMORANDA.

**The Romano Electric Grill.**

AT lunch time one day last week, being in the neighbourhood of Romano's Restaurant, the writer made the apostatical resolve that he would step down into the grill-room, and have a chop from the wonderful electric grill which the electrical papers sang about so loudly, and in unison, early in the year. It was the second time that he had so resolved. The first time it was a chump chop that occupied his plate—a chop with its edges carbonized, and branded by the bars of the grill. Dissection showed that, though some little time had been expended in waiting for the chop (it was during the rush of the lunch-hour), its condition inside was diametrically opposed to that of the outside. But there was interest in the experiment, because of the beating of the big drum, and the reports of the marvellous economic performances of the grill when it first made its appearance at Romano's. It was about seven or eight months ago when this happened. Seven or eight months do not constitute a long period in the history of a piece of restaurant cooking apparatus, even at a busy place like Romano's. The writer again last week turned down the steps to the grill-room, and at once missed the electric sign bearing the words "Electric-Grill," under which formerly one was compelled to pass in order to get a chop or steak. Its place knows it no more. It had been disconnected and removed; and only the untidy ends of the wires that fed it marked its old situation. The writer pushed open the door of the grill-room. It was dark, empty, and cheerless. A man stepped forward. "This is closed, Sir; but you can get what you want in the balcony." "Is the electric-grill up there now?" "No, Sir; it's still down here, but"— The explanation that had sprung to his lips faded away; and, instead, a smile irradiated his countenance, as he evidently fancied he detected signs of curiosity. He may have been a Romano man, he may have been an electrical man, or a gas man, or a coke-grill man—the writer has not the faintest knowledge. But there was the fact. The sign of the "Electric-Grill" had gone; the electric grill-room was out of use —and only a few months after the much vaunted grill had entered upon its service? Has the service come to an end? Has experience been of an order that has condemned the grill to eviction, and a grill substituted which will show, through the use of another "fuel," a larger and more economical thermal value? Time will show. If the disadvantages of the electrical tenant have thus early disclosed themselves, there is a poor look-out for this class of goods in the restaurants of London and elsewhere. Only the other day we saw that the Brompton and Kensington Electrical Accessories Company had been scrapping some of the electrical apparatus at their Earl's Court Road restaurant, and had put in new. But this Romano electric-grill! Its fate is interesting, because was not the fat that was said to be sweated out of the chops and steaks—priced at 8d. per lb. by the joyful electricians [see "Memoranda," March 10, p. 638]—paying for the electricity consumed as well as the electric-meter rent? Surely, under such circumstances, the eviction of the grill cannot be imminent. It is hard to believe any such thing. But where is the sign; and why was the grill-room closed last week, so soon after the changes had been made there? Perhaps time will give the answer.

**Osram to the Fore.**

Since the war started, there has been a wonderful awakening in the electric incandescent lamp-making industry. The lamp makers—"Osram," "Mazda," "Wotan," and Tantalum—have all been anxious that the Electrical Press should see with their own eyes the verity of the existence of British lamp works, and the practice of the processes of manufacture, in this country. Most of the papers have published accounts of their visits to the works—largest attention being paid to the Osram Lamp Works, Limited, the much-abused offspring of the General Electric Company, whose advertising powers during the German trade crisis in this country have been strikingly present. The Company thoughtfully provided their journalistic visitors with copious notes, which have helped to give to the descriptions a fine family likeness. Some of the writers, however, have prefaced and interlarded the accounts with some of their own impressions and thoughts. "Electrical Industries" did so. This paper thanked the German Emperor (having little else for which to thank him) for having given it the opportunity of visiting the Osram works. It is difficult to see why the Kaiser should be thanked, unless he is an interested shareholder. A great proportion of the share capital of the Osram Lamp Works, it is well known, is held in Germany; but there has been no statement that the Kaiser's foreign investments include shares in this particular venture. The undertaking, says our contemporary, is no more German than any British enterprise which pays royalties to a foreign patentee [misread, in the first instance, for potentate]. There is no great objection to the investment of German capital in this country; but really it is impossible to see any distinction constituting a difference between the Osram Lamp Works and any other Company whose capital, or the greater part of it, comes from Germany. The patentees of the Osram lamp stipulated that, as payment for their patents, they should receive shares in the Company. It is the same thing as being paid for the patents in cash, and the owners making it a condition that the cash should be invested in the concern, so that they might perpetually enjoy a large

proportion of the profits. In the circumstances, the only difference from the patent owners' point of view is that, instead of making the lamps abroad and exporting them to this country, they, as considerable partners in the business, permanently make their profits here. They were wise in their generation. We do not blame them. Possibly had we a patent for a good marketable appliance, we should do the same. But it is no use trying to pretend that a thing is not what it actually is, and that is what has been, and is being, done in the case of the Osram Works.

**Lamp Making, and a Little Sympathy.**

The descriptions of the processes of tungsten filament lamp making afford interesting reading. They show that the price limit at which the lamps can be profitably sold has been about reached. The processes through which an electric lamp goes before reaching completion are many; and lavish care has to be bestowed upon them. The only part of the manufacture which is described as "secret" is the development of the wire-drawn filament. But the Osram people let light upon the "secret" to this extent: The pure tungsten is obtained by the reduction of the ore to a finely powdered form. The powder is first compressed under great hydraulic pressure into the shape of a thin, rectangular bar, which is maintained at a high pressure in a hydrogen flame in order to remove all impurities. A current of electricity is then passed through it, bringing it into a more solid state, and preparing it for the process of swaging, by which it is worked up into a condition suitable for drawing. The swaging is essentially a process of hammering under heat; and it results in altering the shape of the ingot to a long thin rod of ductile tungsten. This rod is then drawn down to the required fineness step by step, more or less in the usual way. The tungsten wire is wound upon bobbins, and stored for use as required. The caps and bulbs for the lamps most of the makers import; but the General Electric Company, as shown a fortnight ago, have up North a subsidiary company producing bulbs. There is one point about the fragility of the metal filament lamp. With one accord [probably inspired by the Company's notes], the writers of the descriptions refer to the rapidity with which the lamps are enclosed in their cartons, and stacked into crates; and the treatment is considered by one writer to be about equal to the vibration that the lamps would receive on board a Dreadnought. There is no question that, generally speaking, the filaments of these lamps, when new, are stronger than they were at one time; but their fragility increases with use. In describing the manufacture of the "Wotan" and the "Tantalum" lamps at the Siemens' works at Dalston, the "Electrical Times" expresses and reiterates deep sympathy with Siemens Bros. and Co. over the attacks made upon their capitalization. No one complained, no one troubled, and no one cared about this before the war. It would be a proper course to take prior to assailing German-found capital for building-up enterprises in this country, if the electrical papers would attack the old-established electrical system of placing so many orders for plant in Germany, and the patronage of concerns that are purely—open or masked—agencies for the products of German factories, equal to which products in efficiency (and superior in some other respects) are British-made brands. More blame attaches to the patrons than to those who were enterprising enough to take advantage of the opportunities so generously offered to them. But the patrons have escaped censure in the one-sided electrical papers.

**The Half-Watt Lamps.**

Most of these lamps (for which their originators failed to find a faithfully descriptive cognomen) that have hitherto been in active service in this country have had a sea voyage before taking up their eye-devastating duty. The electrical ramifications of Germany appear to have no bounds. The British Thomson-Houston Company are now busy making the new type of lamps at Rugby; and the Osram people, it is understood, are also putting up the plant necessary for their manufacture. A member of the staff of the "Electrician" has been down to Rugby to see what is being done by the B.T.H. Company in this connection. Again, we are told that there are many details in the manufacture of these lamps which "we are not at the moment permitted to describe." Competition is great in the electric lamp industry, and so are works' "secrets." The machinery employed for producing the "half-watts" has to be "highly accurate," and the workers have to be capable of performing many "delicate operations." The care that has to be exercised is seen through the article, from which is extracted this illustrating piece: The feature of the new lamp is the spiralized filament of drawn tungsten wire; and in both the production of the wire and the winding of the filament, the utmost care is needed. It is not merely a matter of reeling the wire off a bobbin, winding it into a spiral, and mounting it on suitable supporting hooks. It is necessary to safeguard against the cracking of the material at each of the turns and the points at which the spiral is drawn out and bent so as to rest naturally upon its supporting hooks. These safeguards are mechanically ensured by automatic machinery. The high temperature at which the filament is worked also calls for special treatment of the leading-in wires, of the glass stem which carries the supporting hooks, and also of the glass employed in the bulb itself. As far as possible, both the glass and metal parts of the lamp are temperature graded, so that there shall be a minimum risk of trouble arising from unequal expansion of any of the materials. The fact that some of the higher candle-power half-watt lamps require almost as much energy as a radiator necessitates special attention being paid to the leading-in wires and to the method of attaching them to the screw cap which forms the contact portion of the lamp. In every advance, structural simplicity is on the side of gas—whether it be in lamps, cookers, fires, or other appliances.

**A Big Deficit in the Potteries.**

The Potteries Electricity Committee have got themselves into a very ugly financial tangle; and all the surrounding conditions seem to be the worst possible for getting out of it. A sort of "Rake's Progress" has set in; and despite the gigantic display of optimism on the part of the apologetic Chairman of the Committee (Alderman Leese) at a recent meeting of the Stoke-on-Trent Town Council, things are not likely to work out so smoothly as he imagines. The Committee are staking their position and business reputation on one thing, and that is the economy hoped to be derived from the new power station. Regarding this, let it be pointed out as a prelude to what has to be said that the generating costs of an electricity concern only represent about 25 per cent. of the total costs. Last year the Committee had to confess to a loss of £6162, notwithstanding two factors in their favour—one was an increase in output of about a million units, and the other that for one-fourth of the year they had the advantage of the new central station. To make the £6162 look as small as possible, Alderman Leese divided it into net actual loss on working £3920; the balance for meters, replacements, and odds and ends of other expenditure. As to the working expenses, the Alderman pointed out that £1745 was an increase on the cost of coal; but he did not indicate (judging from the report in a local paper) that naturally, with an extra million units of output, the cost of coal would increase, apart from the higher cost per ton. The cost of electricity meters, owing to their brief and sometimes eventful life, the Local Government Board advises, should always be charged against revenue; and repairs and replacements have no other legitimate home than the revenue account. Even with new plant, from the moment it is put into active service, the process of depreciation commences. One cannot get service out of plant and cables without depriving them of something. Rates and taxes, too, have gone up, owing to the reassessment of the works. There is nothing in this fact which mitigates conditions. Every undertaking should bear its proper proportion of local liability.

**Excuse and Optimism.**

The speech of Alderman Leese was compounded of excuse and baseless optimism. In less than two years, he said, the debit balance would be wiped out. Evidently he does not anticipate any more debit balances, to add to the £6000 odd he has from last year. He may be mistaken. The central station, it is believed, is going to do the trick, together with the increase of business. The latter, under present conditions, is something upon which there must not be too great reliance. The debit balance from last year is not going to be made a charge on the rates. It is simply going to be carried forward; and its presence will be erased in the good times that are coming. There are blocks in the way, but they do not worry Alderman Leese. Alderman Geen stated, at the same meeting of the Council, that the Finance Committee at a recent sitting had been startled to find that the electricity revenue account had been overdrawn to the extent of £16,000 and the capital account to the extent of £21,000. The Council have now to approach the Local Government Board for a loan to meet the overdraft. Loans are expensive just now; and when loans replace the overdraft, there will be additional capital charges to meet. The Local Government Board will also have something to say, before granting any new loan, about having losses in suspension. Capital charges will go up; and the charges against revenue for repairs and renewals must continue to be heavy, for the department do not appear to have what every business of the kind should have, a depreciation and reserve fund—the former to meet the wasting away which, despite repair, constantly goes on, and has otherwise to be charged against revenue as renewals, whether the year be good or bad; and the latter to make good exceptional charges due to exceptional times. Municipal traders try to hide a multitude of commercial sins under the sinking-fund payments. But it is no good. The base is not large enough to cover them all; and they will protrude, and make an unsightly display all round. Alderman Leese's confidence is composed of something that appears to be all up in the clouds.

---

**Regent Street Polytechnic Lectures.**—The course for this session of lectures at the Regent Street Polytechnic, arranged to meet the requirements of those who are, or intend to be, engaged in connection with gas manufacture, began last week. There are three subjects—"Gas Engineering and Manufacture," (Lecturer, Mr. Alwyne Meade, Assoc.M.Inst.C.E.), "The Chemistry of Gas Manufacture" (Lecturer, Mr. Frank E. Weston, B.Sc.), and "Practical Mathematics." Students are strongly advised to take up each subject of the course, which meets the needs of those who are desirous of obtaining City and Guilds of London Institute certificates. The "Gas Engineering and Manufacture" and "Chemistry of Gas Manufacture" lectures are each divided into two grades.

# POPULAR FIRES, AND ALL "HIGH GRADE."

**New Productions by Messrs. Fletcher, Russell, and Co, Limited.**

INTERRUPTIONS from the normal course of business during this year—the causes of which are well within memory—have not prevented Messrs. Fletcher, Russell, and Co. from producing, for the heating season now commencing, new designs in gas-fires, and incorporating improvements in former types. "High-grade fires" is a term that has more than a single meaning. Ordinarily it is applied to fires that have an external appearance compatible with the most sumptuously decorated and fitted rooms. Such fires are seen in the show-rooms of the firm. But the term "high grade," they maintain, and with very good reason, can be applied to all their new fires; for their aim is to ensure, in even the cheaper lines, heating and hygienic efficiencies of top order, so as to give to the householder of moderate means the same measure of satisfaction as to the man who has a more expensively cased fire. In this they have abundantly succeeded, as tests of the newest types of fires have proved; and these types are, in our opinion, going to be very popular. There is an extensive field for (to use the expression for the heavier priced types) high-grade fires at the lower prices. Even in the best class houses, there are a number of rooms in which fires of more modest form than the expensive ones, and yet of high efficiency, are required—where, in fact, the other fires would not be compatible. The myriad of middle-class residences, too, require the same form of fire; and so do gas undertakings, in order to develop their hire system. On these aspects of gas-fire need and demand, Messrs. Fletcher, Russell, and Co. have kept their eyes in developing the range of their types of fires for the new season.

## DESIGN AND INTERCHANGEABILITY.

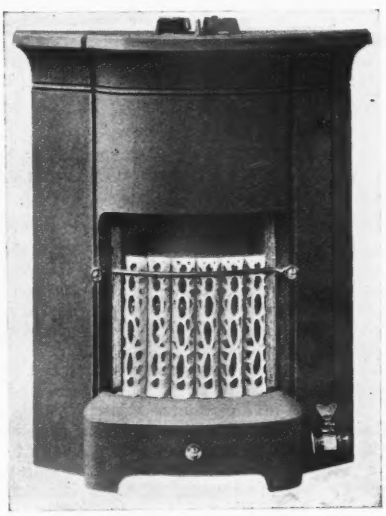
For the new fires, the firm have found names all with the initial letter D—the "Dart," the "Dee," the "Dove," and the "Dane," which are all simple, easily remembered appellations. In gas-fires, as in other things, fashion changes, but not mere whim orders or induces the change. There has grown up quite a general demand for plain surfaces; and gas-fire makers have encouraged this demand, because, while good effects are obtained, the plain designs, with gentle and pleasing curves, and no angular parts, no sunk decoration, no open work, and no panels (as of old) containing tiles, are an improvement in that they all contribute to a greater perfection, by facilitating cleanliness, and offering no lodgment for dust. The new fires are all with smooth castings, and of simple line and curve, which give them a very attractive appearance, whether finished in black enamel or majolica enamel. Look at the illustration of the "Dart" fire; harmony runs throughout the design. The outer part is a combination of straight lines, and a slight intermediate curve. The canopy grows (so to speak) out of the casing with gentle slope. The fret at the bottom has received the same treatment. Somewhat different characteristics are to be found in the "Dee" and the "Dove" fires. In these, except the outer edge of the casing and the sides of the fires, there are no straight lines; but the whole casing from the outer edge and in all parts has a gradual curvature to the fire, which gives a very taking artistic appearance. This is strikingly noticeable in the "Dove" fire. The "Dane" fire is really a modification of the firm's much-favoured "Tokio" fire. The outline of the "Tokio" has been retained, but the plain casting has been adopted, which, with the curved fire, has improved it. The design of these four fires, in fitting and finish, makes them suitable for any position in the modern residence.

Interchangeability is a feature of the fires; and this is a great advantage to gas undertakings in respect of maintenance. With corresponding width and shape of fire, all parts are interchangeable, and so the work of renewal is easy. This has a good effect on stock economy in any hiring-out and maintenance system. The "Dart" is made with 10 and 13 inch fire openings; the "Dee" with 9, 10, 13, and 15 inch fire openings; the "Dove," with 10 and 13 inch fire openings; and the "Dane" with 9, 10, and 13 inch fire openings. The fronts of the fires can be removed by simply unscrewing two nuts.

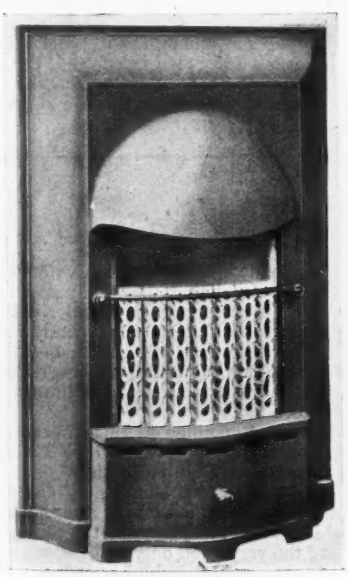
The new fires have all been constructed to pass the "Lancet" test. The ample, and yet (through the curvature) unobtrusive, canopies will be noticed; and these with the studied internal construction of the fires are a guarantee, with normal chimney conditions, of freedom from the passage of products of combustion other than through the flue-outlets. These also are of ample area—being oblong in shape, and extending almost the full width of the fire. This design of flue-outlet has entirely overcome the old trouble of "pulling" the side flames towards the centre of the fire, as was the case when the round flue nozzle was the vogue.

## SILENCE AND EASE OF ADJUSTMENT.

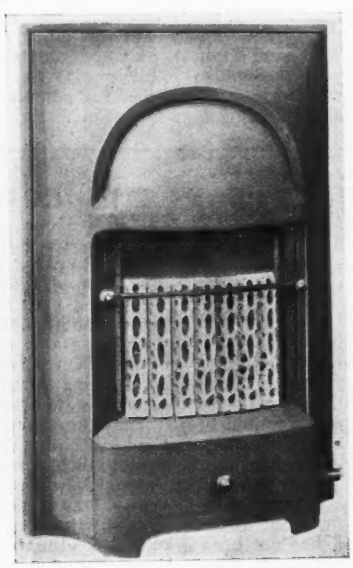
If there is one thing about gas-fires for which the firm gained an early reputation, and have maintained it, it is in that vital part—the burner. Their patent non-lighting-back burner has always proved itself so sure and so efficient in securing perfect combustion that it has been impossible to find a way in which it could be substantially improved. The fires in the ordinary way are fitted with these burners. But, of course, if required, "Duplex" burners can be substituted. The demand to-day is for a silent burner; and the firm have introduced a very simple expedient for securing this highly essential feature. The fitting which has been devised is a combined gas and air adjuster; and it possesses the merits



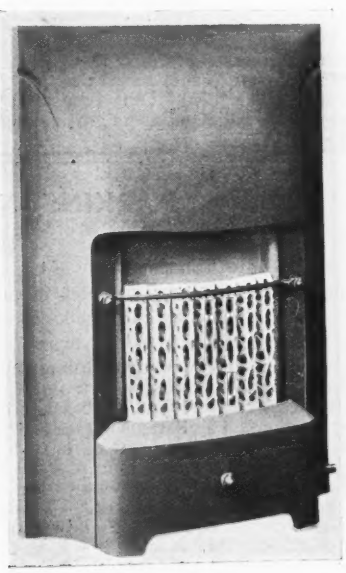
The "Dane."



The "Dart."



The "Dee."



The "Dove."

THE NEW SERIES OF GAS-FIRES BY MESSRS. FLETCHER, RUSSELL, & CO., LIMITED.

of being uncomplicated, cheaply produced, and quickly set by the gas-fitter for effecting its designed purpose. Into the barrel of the fitting, one end of which constitutes the gas-injector, is a large parallel screw working up and down. This engages with the end of a spindle, with projections on it to keep it centrally in the barrel. The end of the spindle is tapered to a fine point, the taper working in a central hole in the perforated gas-injector. Internally in the injector end of the fitting is a spiral spring operating on the spindle. When the large vertical screw is turned down, it partly closes the gas-way, and at the same time drives the spindle forward, and so reduces the gas passage at the injector point. When the screw is again raised, the spring sends the spindle backwards, and so more gas is allowed to pass. In this way, by one and the same operation, a check is placed by the screw upon the gas, or more freedom is given to it, as required, while there is corresponding regulation at the injector, and regulation which allows the gas always to discharge uniformly through the injector apertures. There is also an air-adjuster for use if needed. By this simple contrivance, the fitter can readily adjust the flames of the fire, so as to obviate all unpleasantness in the way of noise. The "fret" which covers the burner is kept in place and is removable by a single central thumb-screw, so that the burner is very accessible, and labour in keeping the fires up to the maximum efficiency has been reduced to the minimum.

### The Fuel.

It should be mentioned that in these fires the burner is held rigidly in position by two screws, as it is vital to efficiency, when replacing the burner after cleaning, that it should be returned to its original and correct position, so that each flame plays into the centre of its corresponding column of fuel. The fuel supplied to the fires this season is a considerable improvement in quality. The firm are satisfied as to its durability; and on our own part, we are, from inspection, satisfied as to its radiant efficiency and attractive appearance in use. The "build" of the fuel is such that through the face one gets from the back practically the entire uninterrupted heating effect, and a full view of the whole incandescence, which is a comfortable "view" on a cold winter's day. The top cross fuel has been specially made for the purpose (instead of the top being merely composed of shortened pieces of ordinary fuel); and this gives a real, not a rough, finish to the face of the fuel.

### Boiling-Rings.

The "Dane" fire has a top boiling-burner fitted; but it can be had without. Any of the fires can be furnished with a side boiling-ring, if desired.

### Improvements, and High-Class Fires.

It is impossible to notice all the improvements made by the firm in different types of fire. But as advance in construction which raises efficiency is effected, the older types of fires receive the benefit of them. For example, the "Rosario" fire has had certain alterations made to it, which cause it to be even a better fire than it was last heating-season.

The "Hero" fire, which was specially designed last year for spacious apartments requiring a fire in keeping with the appointments—such as large dining-rooms, libraries, and the halls of mansions—has met with great success. It is a fire of distinctive feature in design, and with every detail artistically harmonizing; and therefore the firm have the fullest confidence in presenting it again this year to meet the demand for a high-class fire.

### Inset Fires.

The demand for this type of fire is never likely to slacken, so long as coal-grates are found in houses, and so long as coal-grates continue to be put into them. They are, as a matter of fact, the very best thing to offer those people who do not like the set appearance of the gas-fire (and there are such people), and those who do not want to alter their existing coal interiors. Architects particularly like them. Other considerations are that they are economical in initial outlay and maintenance; and their fixing is quite easily accomplished. The "Jet," the "Grosvenor," and the "Mayfair" are the types that the firm specially recommend.

In the case of the "Jet" fire for ordinary coal grates, the burner is fitted into the grate or on to a specially designed carrier, and is completely protected. The firm's finger jet burners are used in these fires; and as the fingers can be made of any length or form, there is no condition of coal grate that cannot be negotiated—whether of straight, curved, or serpentine front. The burner is fitted with the non-lighting-back burner, and modern gas and air adjustment. In building-up the fire, a row of pillar fuel is placed over the burners on an incline. The base of the fuel comes right down to the bottom of the grate, and so screens the burner from view. Between the back brick and the top of the fuel, a cross row is placed; and a finish is given with black cinder fuel. The firm have made this fire look very realistic.

The general references already made will largely apply to the "Grosvenor" fire, which is designed, using the jet burner, combined with suitable bricks and fuel, for grates of the barless types. Curved back finger jets and a fire-brick base are used; the fuel being placed on top of the latter, and then finished with the cinder fuel—the long fuel being studded so as to retain the cinder fuel in position. Fires of this type, the firm claim, supply to the user the highest value in the shape of radiant efficiency per cubic foot of gas consumed. Converted fires of this and other forms can be hired out at a particularly low rate; and in this line several large companies are doing an exceedingly good business. As to efficiency, the heat thrown out by one of these fires when under inspection was such that it was necessary to move away from it a little distance before making a complimentary expression on the point.

The "Mayfair" fire has been designed to convert "heaped," "well," or "barless" fires into modern gas-fires. The jet-burner is used, with a skeleton burner carrier with curved front, special bricks, pillar fuel, a row of square fuel behind the pillar fuel, and a finishing line of top fuel—a fuel holder and a dog or clip completing the requirements.

By these various means, it will be seen, any coal-grate can be dealt with, and in any one of the styles that best suits the taste of the householder. This is scientific conversion, and not conversion in the old haphazard way, with uneconomical result, of some years ago, which gave to gas heating a bad name for uneconomy and inefficiency. In meeting the heating requirements of the day, the firm have developed a very complete range of means of an advanced order over old types, which cannot fail in securing by adoption considerable approval.

### Getting among the Architects.

So long have the London show-rooms of Messrs. Fletcher, Russell, and Co. been identified with Queen Victoria Street, that it comes almost as a shock to learn that the old place will soon know them no more, but that they will shortly be removed to premises from which the work to which they are principally devoted can be conducted with enhanced convenience. The firm have decided to locate themselves in the territory of the architects. This is no hasty resolve. We remember that, some few years ago, the Commercial Managing-Director of the firm (Mr. Charles Clare) held strongly that, as good headway had been made in establishing in the medical profession the virtues of the gas-fire, the architects should be the next to be convinced that heating efficiency and refinement, and the true handmaid to their own work, was the gas-fire. The firm have now decided to go into the Holborn district among the architects, believing this to be the correct policy. The firm is not a retail one—their business being with gas undertakings and the trade. The Holborn district will be as convenient as Queen Victoria Street for their customers, with the added advantage of being among the members of the architectural profession. Before the move is effected, the firm will apprise their customers of the new address, and the date when the new show-rooms will displace those that are at present in Queen Victoria Street.

## PARKINSON FIRES FOR THE COMING SEASON.

The steady growth in popularity of the gas-fire, consequent on the high state of efficiency to which it has been brought and the better understanding by the public of matters of hygiene, is every season demanding fresh activities on the part both of the suppliers of gas and of the apparatus manufacturers. The former are called upon to increase their facilities for hiring or selling fires, while the makers find it necessary to extend their capacity for production. The Parkinson Gas-Stove Company, Limited, of Spring Hill, Birmingham, may be cited here as a case in point. This firm have for a long time past felt that drastic steps were required to satisfactorily cope with the growing business; and now these steps have been taken. That is to say, a new factory has been erected, equipped in accordance with the most up-to-date practice. This success, it will be admitted, has not been undeserved; for the Company have always been well to the fore in the design of their fires from the standpoint of efficiency, as well as from that of appearance. One thing which they claim is that the flue-outlets and backs to their fires are specially constructed to carry off all the products of combustion without the assistance of a sheet-iron elbow, and that they will pass all the recognized tests required by gas undertakings. Under the improved conditions of manufacture, the Company confidently anticipate being able to still further improve their goods; and there is no reason whatever to doubt that, as each season arrives, so enterprising a firm will be found to have succeeded, in one way or another, in beating their own records.

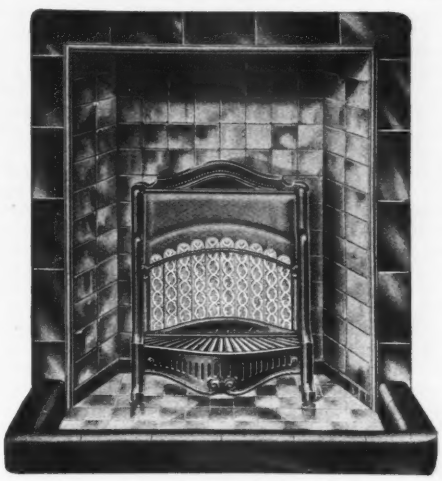
That they have accomplished something in this direction for the forthcoming winter season was made evident by a visit last week to their London show-rooms in High Holborn, where there were on view several new and promising productions. The newness, it may be pointed out, is mostly in matters of size and form. The same pattern of fuel is used as last year, and the same type of burner—the reason being the very good one, that no means of improving upon them have been found. Nothing is omitted which it is thought would add to the efficiency of the fires. As to appearance, the general feature of the designs is plainness, with good sweeping lines—a plainness which appeals to many people as

The "Truefit."

looking richer than more ornamental casings would do. Of this style, it may be remembered (to mention only two instances), were the "Ratcliff" and "Edmund" fires, which were introduced last year, and met with a great deal of favour. So popular indeed did they become that for this season a smaller and a larger size of each is added to stock. That is to say, in addition to 10-inch and 13-inch, the fires can now be had in 8½-inch and 16-inch sizes—the last named being a really imposing looking article. The "Edmund" is also supplied with an extended back in different heights, in order to form a complete interior. The series has now been further added to by the introduction of the "Congreve," which is a similar fire, except for the fact that it is provided with a flat top, and a boiling-burner if required.

A strikingly handsome fire is the "Dominion," a new pattern of "dog grate" type, on artistic lines and at low price. There should be a big demand for a high-class and efficient fire such as this among consumers who are desirous of having something a little out of the ordinary for placing in a tiled recess or open hearth. It is made in two sizes, with a copper reflector fender, and, of course, all parts are easily accessible and removable. Next there is the "Truefit"—an aptly-named inset fire, which is designed to accurately fit an existing coal-grate. It is complete and thoroughly up-to-date in every respect, and is made in four sizes. It meets the views of those who do not care to have a gas-fire placed in front of an ordinary grate; and the method of fixing is simple. All that it is necessary to do is to remove the front bars of the grate, place the fire in position, and make the gas connection. An adjustable fender is provided, which covers up the space between the fire and the hearth.

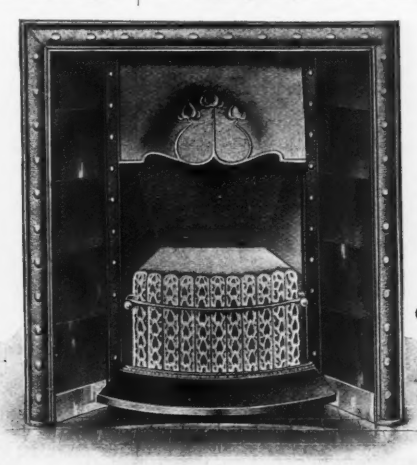
Lastly, we come to the "Pagan" set, which consists of all the parts that are necessary to enable a gas-fire of the most modern type to be readily built-up in any existing fire-grate. The bars of the grate are removed, and then the foundation plate and fuel-carrier (to which the burner is attached) is placed on the bottom bars; the gas-connection being afterwards made. Fire-clay bricks are next built-up on the plate; the fuel-bar support being inserted on the second course of bricks, and held in position by the top course. The set is made in three sizes, and the foundation plate



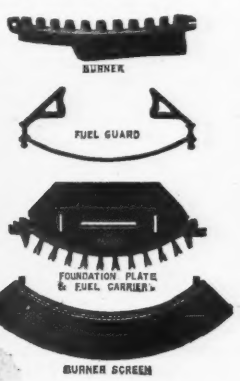
The "Dominion."

is so stamped that it can readily be broken off to other sizes, as required. The burners, which can be had either curved or straight, are arranged in accurate alignment with the fuel; and there are air and gas adjusters. A burner-screen completes the transformation, and gives a finished appearance to the fire; the disadvantages of coal being in this way changed for the advantages of gas, at an outlay which cannot by any means be considered to be excessive. It is pointed out that all products of combustion are carried away, as the whole area of the chimney is utilized; while another advantage is the practical interchangeability and easy access to all parts for adjustment, maintenance, and cleaning. An illustrated abstract of the patent specification relating to this fire (which is the invention of Mr. S. R. Barrett, of Birmingham) will be found on p. 36 of this issue.

The "Congreve."



The Finished Gas-Fire.
The "PAGAN."




The Parts.

## New Telephos Appliances.

The fact that they are British made is emphasized in the catalogue of "Telephos" patent distance gas-lighters for inverted or upright burners, a copy of the latest edition of which is just to hand. These neat and serviceable appliances are, of course, marketed by the Telephos Domestic and Street Lighting Company, of Farringdon Avenue, E.C.; and a main feature of the system is that it does away with the need for a bye-pass. Glancing through the list, it is noticed that attention is specially drawn to the improved inverted "Telephos," type B, which has been designed with the object of facilitating inspection and cleaning without removing the switch from the fitting or interfering with the mantle. New models are to be found described and illustrated on various pages. There is, for instance, the "Smart Set," which is arranged for one light only, and can be had with the battery and push combined or with these two parts separate—the battery in the first case being placed in a polished box. Then there is the "Telephos Candle," which consists of an incandescent burner-head and igniter attached to a porcelain "candle" body, with gas and air regulators at foot. This is designed to take No. 2 "Kern" mantles; and it makes a very effective and ornamental fitting. The Company are to be congratulated upon an excellent little booklet which they have prepared giving hints on the fitting of their apparatus. This includes instruction on different points, and a number of useful wiring diagrams. It shows what to do and how to do it in fitting up a "Telephos" installation, and also explains the principal points of the apparatus.

# WORKS TOPICS.

By "Modus Operandi."

### Mechanical Lubricators.

A good deal of money can be saved by closely investigating the various methods of lubricating machinery in gas-works. Attention should also not only be confined to "methods;" for the grades and qualities of oils in use have obviously much to do with the general efficiency of the system. Some are too inclined to economize on the lubricator, to the detriment of the engine and its working, and with the inevitable waste of oil resulting from such economy. In lubricating the working parts of any mechanical motion, it is necessary to bear in mind that the ideal means of doing this would be to inject continuously a minute quantity of oil; the quantity automatically varying according to the speed of the mechanical motion. In practice, such an ideal is impossible of achievement because no mechanism for distributing the oil can be so delicate that it will inject a fine and continuous stream of oil (amounting in some cases to no more than one-thousandth part of a grain per second); but this would be ideal.

It is, however, possible to adopt mechanical lubricators, which will to all intents and purposes effect this exacting requirement in everyday working. With such lubricators, the oil injected can be adjusted with absolute accuracy as to quantity and regularity. Their practical value has been proved on countless occasions; in fact, wherever adopted. By their use, it is possible to improve the running of an engine, and to economize to a considerable extent in the quantity of oil consumed. The regular injection of oil saves friction which, in its turn, saves power and wear and tear. A glut of oil at infrequent intervals—such as results from the use of the older types of lubricators—is both wasteful and ineffective. The oil is largely wasted, and the engine is improperly lubricated.

Mechanical lubricators are largely used for the oiling of engine-cylinders; and it is in this connection that these remarks are intended. The lubrication of other parts will be considered later on. The type of lubricator which, in the writer's experience, halved the amount of cylinder-oil used in each case where fitted, may be described as follows: The apparatus consists of a glass reservoir in which the oil is poured as required; a sight-feed attachment for regulating the oil admitted to the cylinder; and a double-acting pump-plunger, operated by ratchet gear, which is driven from any convenient point on the engine, for forcing the oil through tubing into the cylinder. The plunger draws oil from the reservoir on its outward stroke, and forces it through the sight-feed to the delivery on its backward stroke. On the succeeding outward stroke, the plunger drives the oil through a valve into the cylinder. It follows that much more oil is put into circulation than is actually required in the cylinder. An ingenious arrangement is provided, so that the oil not required is by-passed back into the reservoir, so that only the oil which can find its way through the tiny aperture at the sight-feed outlet is actually forced by the plunger into the cylinder; the remainder is expelled through an outlet into the reservoir. In the delivery pipe, a ball-valve is fixed to prevent steam, oil, or water in the cylinder from returning and upsetting the working of the apparatus. This type of apparatus is known as the "Hart Force Sight-Feed Oil-Pump," and has been put on the market for many years by Messrs. Green and Boulding.

For engines with more than one cylinder, these lubricators are constructed with ratchet-gear operating as many plungers as there are cylinders; so that each is supplied with an exactly similar amount of oil.

Having regard to the improvement in running of engines lubricated on this principle, and the notable economy in oil consumption, the cost of this apparatus is very moderate indeed, and is as follows:

| | | | | | |
|---|---|---|---|---|---|
| Oil-pump with | ¼ | pint reservoir | £2 11s. 0d. | each, less | 15 per cent. |
| " | " ½ | " | £2 18s. 6d. | " | " |
| " | " 1 | " | £3 13s. 0d. | " | " |

and correspondingly higher prices for the larger sizes, which are, however, rarely required. There can, therefore, be little reason to induce engineers to use old types of lubricators when thoroughly reliable mechanical lubricators, which have been found to work for years without attention, can be bought so cheaply.

### Lubrication of Pump-Cylinders.

The lubrication of pump-cylinders is often exceedingly bad. Pumps are supplied by many firms fitted with an old-fashioned tallow cup for lubricating purposes. Such lubricators are to be absolutely condemned if good running is to be obtained. With a tallow cup, it is intended that the man in charge shall periodically fill up the cup with oil, and shall then close the top and open the bottom cock when the charge of oil is admitted to the cylinder. As a result, the pump is for the time being flushed with a glut of oil, most of which is driven out in an unused state with the exhaust steam, while the remainder thoroughly lubricates the cylinder, piston, and piston-rod for a comparatively short period. But whether or not the effect will last until the man in charge "finds time" to give it another charge of oil, is quite another matter. So often the periodical lubrication will depend on the squeaking of the pump—an altogether barbarous warning. If on the other hand tallow be used (as originally intended when tallow cups were first introduced) a gradual "feed" is thereby provided, owing to the slow rate of melting of such solid lubricant. So far so good. But, it must be remembered, tallow is readily decomposed by steam to produce fatty acids, which have an undoubtedly corrosive effect on all metals with which they come into contact. Both the lubricator and the lubricant are, therefore, to be condemned.

Such methods are still largely in force, but should have no place in the works of any man who takes interest in the running of his plant. Why, it may be asked, is so crude an apparatus so often seen in use? This is probably due to the keen competition of pump-makers who wish to offer a complete pump at a low price. It is the same principle as is followed by the makers of other machinery which has to compete in a keen market. In such cases the quality of the accessories is of a very low order. This being so, it behoves engineers to specify a proper form of lubricator; for, failing this, satisfaction cannot possibly be gained from the running of the pump. The wear will be excessive, and the efficiency in working poor.

A very suitable type for pumps is the smallest size of mechanical lubricator above described. For quite a moderate expenditure a very great improvement can thus be made in the working of the pump.

[Next week the question of lubrication will be further discussed.]

# COKE FOR STEAM-RAISING PURPOSES.

By a Gas Engineer.

### Part III.

### When Coke can Compete on Hand-Fired Boilers.

Some general features of the question may now be discussed. It will be found in some cases that the adoption of coke will be a foregone conclusion if only the head of the firm will take the proposition seriously, and will give reasonable facilities for proving its worth. To a large extent this will be found to be the case where the boilers are not overloaded, and where coke can be offered at a price lower by about 3s. 6d. per ton than the competing coal. Where this figure is much exceeded, as in the case of Welsh coal, a very large saving is certain to result; for it is not unusual to find that a ton of coke will do practically as much work as a ton of Welsh coal. With good class hard steam coal, priced at a figure midway between coke and Welsh coal, the result should be about the same. It is, in fact, shown in practical working that coke will as often as not do, ton for ton, as much work as this class of coal. On several occasions engineers of factories have informed the writer that, to their intense surprise, coke has shown as good a result as good steam coal. In such cases, the saving will frequently amount to as much as 20 or 25 per cent., though the actual buyer, as might be expected, will never admit it. But the saving is there all the same.

With a lower class of coal, costing about the same as coke, and priced at a figure midway between cheap slack and hard steam coal, it is frequently found that such coal will evaporate as much water as the higher quality hard steam coal. The competition is thus much more difficult. Why then, it may be asked, is such coal sold at a lower price? For the reason that with these cheaper coals more smoke is produced, the duty from the boiler is reduced, and more draught is required. It is for these reasons that the higher quality must be bought. Again, it may be asked, Why is Welsh coal ever used if the result is comparatively so poor? The answer is that, even with hard steam coal, too much smoke was produced, with the result that Welsh coal was introduced in spite of the additional cost. The ignorance displayed in taking such a step would astound the engineer who understands the problem of boiler-firing on economical lines; nevertheless, money is quite frequently wasted in this way through lack of knowledge and through lending too willing an ear to the coal merchant. In such cases it would pay very handsomely to introduce forced-draught furnaces and use a lower class of fuel.

Thus it is seen the quality and price of coal do not depend so much on the possible evaporation of water per pound of fuel as on such factors as that of obtaining a maximum duty from boilers without causing smoke, and without spending money on increasing the draught. So many owners of boilers prefer spending extra on their coal to laying out a lump sum for forced draught apparatus and obtaining a (to their mind) problematical saving on their fuel bill, Expert advice would, of course, show the proper course to take; but experts are rarely engaged for such matters.

### Advantages of Forced Draught.

But this explains why in some cases coke can be introduced with so much economy. In the same way great economy would be shown on those boilers, fired on high-priced coal and overworked owing to poor draught, if only the owners of such boilers could be induced to adopt forced draught and burn coke. On such boilers, insufficiently supplied with draught, it is impossible to use coke unless this is done. Therefore, the pushing of coke is closely connected with pushing forced-draught furnaces.

Gas undertakings which wish to create a good local market for coke as boiler fuel should keep closely in touch with makers of forced-draught furnaces, for their interests are really mutual. It can, in fact, be asserted that, where forced draught is used, coke can in almost all cases be adopted with success. If, therefore, such gas undertakings will inform the makers of forced-draught

apparatus of their intention to push coke for this purpose, and incidentally mention that boiler users will be recommended to instal this type of apparatus, energetic efforts will no doubt be made by the makers to support this move on the part of the gas undertaking. Until forced draught is in universal use, there will be a proportion of boilers on which coke cannot be used; so that in all these cases it is far better to use all possible endeavours to persuade the users to adopt this apparatus, rather than to ask for a trial, which is certain to be a failure. It is here, of course, where knowledge and experience are required.

There will, however, be a considerable number of cases where coke can be introduced with perfect success without the necessity of increasing the draught. It should, however, again be repeated that even such cases will be greatly reduced in number if large coke is supplied. Small coke, of the size specified, is so much superior to large coke for steam-raising that this point must not be overlooked if any real success is to be expected.

### The Practical Value of Coke.

To engineers with knowledge of the British thermal units contained in fuels, it is invariably a surprise that coke with about 12,000 B.Th.U. is able to give as good a result in practical working as coal with 14,000 B.Th.U. This astonishing fact is due chiefly to the vastly improved efficiency of the combustion when coke is used. As explained before, so much less air is required owing to the absence of volatile matter that the resulting economy from this cause is very great. With coke it is unnecessary to admit any air over the grate, whereas with coal not only is it usual to open the air-ports in the doors to the maximum amount, but it is also a common practice to open the doors a few inches in the effort to prevent smoke. The resulting enormous excess of air robs the boiler of a great deal of heat. Again, it is a well-known fact that the heat required for the volatilization of coal (usually stated to be 10 per cent.) accounts for the expenditure of a considerable portion of the heat units contained in the coal. Added to this the soot, so often deposited on the heating surface of boilers fired by coal, is another source of loss which in no case is experienced with coke. These points explain the success with which coke can be used, and the high duty obtainable per B.Th.U.

While in comparing different varieties of coal the B.Th.U. content is a useful guide, it is very misleading to attempt to apply the same criterion to a comparison of coal and coke—for the reasons already given. Gas engineers should, therefore, in no case adjust the price of coke on this basis, without being fully aware that in doing so a good deal is being forfeited in actual intrinsic value.

### Competing with Slack.

In competing with cheap slack, there is no doubt that a good deal must be foregone in the matter of price. In two cases which have come to the writer's notice, it was shown in practical working that 14 cwt. and 16 cwt. of coke were equal to 1 ton of slack respectively, and in each of these cases coke was finally adopted in preference to continuing with slack. In neither case was smoke a serious difficulty; and it may fairly be said that the adoption of coke was brought about by the superior results in £ *s. d.* True, the difference was small; but it was sufficient. These cases are mentioned because it is sometimes considered that coke cannot compete with slack. It should, of course, be understood that slack can only be burnt without causing excessive smoke under certain conditions, and those conditions are by no means always to be found in actual practice. To burn it successfully the load on the boiler must be small, the draught must be good, the firing must be excellent, and, in some cases it might be added, the smoke inspector must be easy-going.

### Cause of Failures in the Past.

There is no gainsaying the fact that there exists a good deal of prejudice against coke. Such prejudice is based npon ignorance. Engineers who have tried it in the past have invariably failed to understand the properties of coke and the different treatment required as compared with coal. As a result, all the essential points (most of which have been mentioned in these articles) have been disregarded. In so many cases there would be no margin for failure to fire it properly; so that it is not surprising to learn that coke has frequently been tried and found wanting—owing to ignorance. It is this want of knowledge which it is so important should be overcome if success is to be achieved.

In all cases where previous and unsuccessful experiments are recounted, it should be explained that the success of coke entirely depends upon a number of factors which are almost invariably overlooked by those who only have experience of coal firing. A good case can usually be made out for a new trial, when all the important points can receive proper attention. Previous faults can be corrected, and a permanent customer obtained.

### Supposed Disadvantages of Coke.

When coke is introduced, every engineer in charge of boilers feels it his right to trot out all the supposed disadvantages of coke. There is, indeed, a surprising unanimity of opinion as to these bogeys. Firstly, there is the sulphur question, and the feared effect it will have on the life of the boilers. In answer to this question, it is as a rule fairly convincing to point out that the sulphur content in coal is usually equally as great as the sulphur in coke, for a great deal of the sulphur is removed from the coal with the gas; and that gas-works boilers which are invariably fired on coke, or similar fuel, have very long records in the life of their boilers, from the details of which a most convincing argument can be prepared. Excessive wear and tear of fire-bars, and a reduction in the life of the furnaces, are again considered to be synonymous with the use of coke. To combat such opinions a record of actual experiences in gas-works boilers is most effective, and will usually carry conviction. The fact, too, that boiler insurance companies never raise any objection to the use of coke bears eloquent testimony to the absence of any undue wear and tear to boilers fired with this fuel. As regards fire-bars, though the wear may be rather heavier where coke is used, it should not amount to more than about £2 per boiler per annum in excess of that experienced with coal; so that it is in reality small enough to be disregarded.

So often the greatest difficulty in attaining the adoption of coke is the question of the alleged additional labour required in firing the boilers. Stokers are so fond of pleading extra work whenever any change is introduced, that this factor is in many cases most difficult to deal with. It is true that in numbers of factories the stoker is also engine driver and the general handy man; and where this is the case, every minute of his day is fully occupied. Consequently, even if it is found that by using coke the firing is increased though but slightly, there is a great deal of opposition to face.

In this question of labour there is no denying the fact that, owing to the bulky nature of coke, the shovel comes more often into operation. There is, too, the more frequent clinkering of the furnaces. Against these disadvantages coke fires need no raking and stirring-up; in fact, such needless attention is detrimental to efficiency. Again, the stoker is so often badgered to distraction over the making of smoke that he is often found to welcome the introduction of any smokeless fuel, even though he may fear that it will give him additional work to do. Another good point in favour of coke is its cleanliness—an advantage which appeals to engineer and stoker alike. The absence of coal dust is usually appreciated by the stoker, who is, for the first time in his life, able to keep clean while at work.

---

The writer at a later date hopes to publish a collection of data, gradually being compiled, in the form of an appendix to the foregoing articles.

## COAL FOR DUTCH GAS-WORKS.

An article (dated the 12th ult.) by "N. W. v. D." in the September number of "Het Gas" discusses the effect of the outbreak of the war on the normal sources of supply of gas coal to Holland, and the possibility of using the native coal of South Limburg for gas-making purposes.

The article states that the "Economist" reported that the price of coal fell in August, owing to the reduction of exports and the disinclination of the public to lay in great stocks. In reply to a question in the House of Commons on Aug. 28, Mr. Runciman stated that coal was being shipped from Immingham to Holland, and that the Government considered that, as this coal was for the use of neutrals, it was not contraband of war. The Government would interfere if it appeared that it was supplied to German vessels. The "Colliery Guardian" on Sept. 4 reported more favourable prospects for the coal market, and that the trade with Holland was brisk, being chiefly carried on through Dutch vessels. On the 3rd of September, the quotation for first quality gas coal on the Tyne was 12s. 9d. per ton, and at Yorkshire pits 11s. 3d. per ton. The freight from the Tyne or the Humber to Rotterdam was, however, 4s. 6d. per ton, and good gas coals were offered for not more than 19s. per ton delivered alongside Dutch gas-works.

The German Government decided on Aug. 28 to permit the export to Holland of coal, coke, and briquettes for consumption in that country. Westphalian coal was then delivered by water without difficulty; but deliveries by rail were irregular. Inquiry by the Dutch Association of Gas Engineers showed that at the beginning of August Dutch gas-works held small stocks of gas coal. The Council recommend gas managers to provide themselves with an ample supply of coal for winter requirements, in case transport by water should be interrupted for a long time by the incidence of severe weather. The Coal Committee of the Dutch Association have considered the question whether coal merchants are justified in present circumstances in demanding a higher price than that named in the contract for coal delivered under it. They are of opinion that it is hardly a question of *force majeure* in the present circumstances, and that some contractors have been too ready to transfer all extra costs to the customer. It is, however, of opinion that it would be fair and reasonable in present circumstances to endeavour to meet the contractors in the matter. The same question, it is pointed out, is being raised in Great Britain [*vide* "Colliery Guardian" of Sept. 4.]

Another question which has come before the Coal Committee is whether the coal from South Limburg could be used as a gas coal. The State Mines Administration reports that the "Emma" coal is the richest in gas in the district. It is a caking coal, containing about 20 per cent. of volatile matter. It is screened and washed at the pit and delivered in the following sizes—viz., large coal, nuts Nos. I., II., III., and IV., and smalls. The washed smalls are supplied to coke-ovens. On analysis they show a tent of 12 per cent. of water; and eliminating this the smalls

give: Coke (Muck's test), 80·9 per cent.; volatile matter, 19·1 per cent., and ash, 7·5 per cent. The yields per ton of dried coal when the smalls are distilled in coke-ovens are: Gas, 11,089 cubic feet, at 60° Fahr. and 30 inches bar.; coke, 16·4 cwt., or 82 per cent. by weight; ammonium sulphate, 28 lbs.; and tar, 38 lbs. The gas has the following composition, in volumes per cent.: Carbonic acid, 1·6; heavy hydrocarbons, 2·8; carbonic oxide, 4·4; hydrogen, 63·1; methane, 23·3; and nitrogen, 4·8. The specific gravity of the gas is only 0·26 (owing to the high proportion of hydrogen there is in it), and its calorific power per cubic foot is 539 B.Th.U. gross, 475 B.Th.U. net. The report states that the large coal and the nuts would give correspondingly better results, and emphasizes the purity of the coal. Though the yield of gas is normal, its quality is inferior to that from gas coal; but in case of a dearth of the latter, the Emma coal should be capable of rendering good service as such. The coke is of very good quality —hard and large, and specially suitable for use in central heating installations. Gas-works having large carbonizing chambers or ovens might well use it in present conditions to produce coke for industrial purposes, seeing that the importation of foundry coke is interrupted.

Gas oils will shortly be freely obtainable, perhaps at somewhat higher prices than were fixed in contracts in the autumn of last year; and gas-works making carburetted water gas need not be without raw material during the coming winter. For some time, however, gas-works in Holland may experience difficulty in finding buyers of tar, and its disposal or storage may prove troublesome. It has been proposed to use gasholder tanks for the storage of tar. This scheme may not be impracticable when the tanks are below the ground level, but with elevated steel tanks, and annular tanks in particular, there would be the risk of the tar becoming too thick in the winter—unless the tanks were heated—and interfering with the free movement of the gasholder bell. Great increase of pressure might be caused thereby.

## AN AUTOMATIC OVEN-DOOR SHELF.

Probably most cooks at one time or another have burnt their hands while dealing with the contents of a hot oven; and so they may be expected to entertain kindly feelings towards a device intended to remove the liability to accidents of this kind. The patentee is Mr. W. Dixon, of No. 82, St. John's Road, Waterloo, Liverpool, and his invention consists of an attachment which draws out the oven-shelves by the action of opening the door, and replaces them in the oven on the door being closed.

**Dixon's Oven-Door Shelf.**

Attached to the oven-door by brackets fitting into sockets screwed on to the door is a quadrant shelf, having a groove near its circular edge. The opening of the oven-door actuates levers so attached to the shelf and to the oven-runner that they draw on to the shelf the tray or framework carrying the food; while the closing of the door results in the tray being returned to its position inside the oven. The quadrant shelf is fretworked or perforated, so as to offer the least possible obstruction to the upward passage of the heat; and, being detachable, it can be fitted into the different slots provided to secure the top, middle, or bottom heat as desired. The invention can be adapted to any sized oven by the lengthening or shortening of the levers; and to allow the tray on which the food is placed to run smoothly, wheels or rollers can be attached to its sides, or to the sides of the oven.

In addition to obviating the need for putting one's hands into a hot oven, the device renders it impossible for the cooking-tin to tilt or fall. The quadrant shelf may, of course, be used as a cooking-shelf independent of the lever device which is intended to draw out the ordinary square shelf. The fixing of the appliance, it should be added, is a matter which does not call for the expenditure of a great deal of time or money.

Before the Junior Institution of Engineers, on the 16th inst., at an informal meeting at No. 39, Victoria Street, Westminster, Mr. Walter T. Dunn will introduce the subject of "The Latest in Home Gas Lighting."

## MANCHESTER JUNIOR GAS ASSOCIATION.

**Opening of the 1914-15 Session.**

The first of the University Lectures held at Manchester in connection with the 1914-15 session of the Manchester and District Junior Gas Association was delivered in the Physics Theatre on Saturday last. There was a fair attendance of members, and some of the Senior Institution were also present.

The President (Mr. J. M'Nicholl, of Warrington), in formally opening the proceedings, said that members would see from the syllabus recently issued that the joint visit with the Yorkshire Junior Gas Association to the Birkenhead Gas-Works had been postponed owing to the war. The works were, as a matter of fact, being guarded night and day by police, who considered it inadvisable that so many strangers should be permitted on the premises. The postponement of their visit (they had eagerly looked forward to it) had caused great disappointment, and they now only hoped it was a pleasure deferred, and that they would be able to accept Mr. Paterson's invitation before the end of the session. He (the President) thought they should apologize to Mr. Twelvetrees for the comparatively small attendance that afternoon. He (the President), however, could only point out the fact that, as the lecturer would doubtless understand, the Junior Gas Associations of England having contributed their quota to the defence of the Empire, it followed that many works were understaffed, and people could not get away to attend lectures, &c. He had much pleasure in calling upon Mr. Twelvetrees to deliver his lecture entitled "Reinforced Concrete." [It will be found below.]

Before doing so, however,

Mr. Twelvetrees assured the President that it was a great pleasure for him to visit the University to address the members. He, however, did not agree with him that there was a small audience—considering all the circumstances. On the contrary, he thought the attendance was exceedingly good, and they might take it from him that he, personally, was very well satisfied.

The discussion at the close of the lecture was of a conversational character, and had reference to the waterproof and fire-resisting properties of reinforced concrete. Among those contributing to it were the President, the Vice-President (Mr. W. L. Heald, of Preston), the Junior Vice-President (Mr. S. Carter, of Garston), Mr. J. E. Lamb, of Altrincham, Mr. W. Fletcher, of Liverpool, and others.

Thanks to the Lecturer.

Mr. W. L. Heald moved that the best thanks of the members be given to Mr. Twelvetrees for his lecture, and for the "homeliness" in which he had answered the one or two questions put in the course of the informal discussion. He (the speaker) was sure they would all benefit from it, and would carry back to their respective spheres some exceedingly valuable information.

Mr. S. Carter seconded the vote.

The motion was carried by acclamation, and Mr. Twelvetrees duly acknowledged the vote.

The members afterwards had tea together at the Carlton Restaurant, Manchester; "round-table" conferences on matters appertaining to gas manufacture being informally discussed.

## REINFORCED CONCRETE.

**A LECTURE**

By W. Noble Twelvetrees, M.I.Mech.E., M.Soc.Ing.Civ., A.M.I.E.E.

**Delivered Saturday, Oct. 3, before the Manchester and District Junior Gas Association.**

The task of delivering a lecture on any technical subject to a scientific association such as that which I have the honour of addressing to-day, always presents a certain amount of difficulty. This is due mainly to the fact that some members have already acquired a considerable amount of information on the given subject, while others have not found it necessary to make the same subject a matter for systematic study.

Such conditions undoubtedly apply to reinforced concrete; and in what I have to say in regard to this material and its practical application to constructive work, I am afraid that many points will possess no novelty to some of those present, although it is to be hoped that they will not be without interest to others less familiar with the subject.

Characteristics and "Raison d'Etre."

The combination variously termed "reinforced concrete," "armoured concrete," "ferro-concrete," and "concrete-steel" is composed of high-grade Portland cement concrete in which a small proportion of steel (in the form of ordinary bars, rods, or strip, or of specially made bars or mesh-work) is embedded, with the object of providing economically for resistance to stresses which concrete alone is not well qualified to withstand.

Speaking in general terms with the object of defining in a few words the characteristics of reinforced concrete, it may be said that in concrete we have a material of great compressive strength and durability, and possessing the valuable properties of withstanding the atmosphere and other influences which cause the

decay of all other structural materials, and of progressively increasing in strength with efflux of time. The only weak point about plain concrete is its relatively low resistance to tension—a property rendering it uneconomical for the construction of members subject to flexure.

On the other hand, we have in steel a material of great resistance to both compression and tension, in practically equal proportions, but marked by the serious disadvantages of being very susceptible to corrosion, and of progressively decreasing in strength (owing to consequent diminution of volume) with efflux of time.

Comparing the two constituents of reinforced concrete, we may say that the most prominent feature of concrete is its permanent durability, and that the chief value of steel lies in its strength. Abundant evidence exists to prove that steel embedded in good concrete is effectively protected against destructive influences. Therefore, if the two materials are combined in a scientific manner, the resulting reinforced concrete will be both durable and strong. As a matter of fact, the combination so designated is also remarkable for its toughness and elasticity, and for the property of giving ample notice of failure, in case of intentional or accidental tests to destruction, instead of failing suddenly after the manner of plain concrete.

In addition to the characteristics of the material itself, it is important to bear in mind the unusually effective resistance afforded by the monolithic method of construction invariably adopted by experienced designers. In pursuance of this method, all the structural elements are moulded so as to be in perfect and continuous connection; so that there is an entire absence of the joints and articulations present in timber and steel construction, and so that, instead of relying largely upon friction and the force of gravity for stability, as in the case of masonry and timber, or masonry and steel, structures, all parts of a reinforced concrete structure are held together by definite cohesion.

The monolithic method of construction has the effect of facilitating the distribution of stresses throughout; and in the event of unexpected strain upon any part of a structure (whether arising from the imposition of abnormal loading, or from accidental damage to some important member), the adjoining parts come to the rescue automatically. Many instances could be cited where this kind of mutual co-operation has had the effect of enabling reinforced concrete structures to withstand with ease totally unexpected strains of such magnitude that it is fair to assume that they would have caused serious failure if ordinary methods of construction had been adopted.

To sum up in a few words, reinforced concrete may be characterized as a kind of elastic stone of such strength, toughness, and elasticity as to enable it to be employed safely and appropriately, not only for all kinds of buildings, but also for light and slender structures for which wrought iron and steel were formerly considered to be the only suitable materials.

The *raison d'être* of reinforced concrete from the economic standpoint can be best illustrated by considering the case of a beam. Assuming such a member to be made of plain concrete, the compressive resistance of which is about ten times its tensile resistance, and the neutral axis to be equidistant from the upper and lower surfaces, it is evident that we have an example of uneconomical construction. Owing to the limit imposed by the low tensile resistance of the concrete, nine-tenths of the compressive strength is wasted. However, by applying a relatively small quantity of steel near the lower surface, the whole of the compressive strength of the concrete can be brought into play. As the proportion of steel under ordinary conditions need not be more than about 0·7 per cent. of the total amount of concrete, the cost of reinforcement is evidently small.

A few simple figures readily demonstrate the theoretical advantage of reinforcement in members designed so that all compression is resisted by the concrete and all tension by the steel. A given section of steel will carry in compression thirty times the load that can be imposed on an equal section of concrete. But, as a set-off, the cost of steel is about fifty times that of concrete. Therefore, for equal resistance, the cost of concrete used in compression is only three-fifths the cost of steel. Again, in tension, steel will carry three hundred times the stress that can be allowed for concrete. But as steel costs fifty times as much as concrete, the net result is that, for equal resistance, the cost of steel is only one-sixth that of concrete.

The practical economic advantage of reinforced concrete in members subject to flexure depends upon the ratio of the compression and tension areas and upon the relative amounts of the two materials. On the other hand, reinforced concrete possesses practical advantages, apart from any question of cost. Among them is the resistance of the combined material to corrosion and fire; rendering unnecessary the heavy maintenance charges and insurance premiums entailed by ordinary construction, and obviating the need of costly fire casings as required for the protection of steelwork. The case for reinforced concrete in columns and members under direct compression is certainly not so strong as that for reinforced concrete beams, because, to a considerable extent, the steel takes the place of a less costly material. To counterbalance this economic disadvantage are the avoidance of fire risks, maintenance charge and the cost of fire casings, and the increased resistance due to monolithic construction.

### General Question of Design.

The fundamental idea responsible for the evolution of reinforced concrete is that the steel shall make good the low resistance of concrete in the tension area of members subject to flexure, so as to permit the compressive resistance of the concrete to be fully developed. It is obvious, however, that to use the steel in an economical manner, it must be subject to such stresses as involve greater strains in the surrounding concrete than the material, when not reinforced, is able to withstand without failure. Consequently, we see that a second duty of the steel is to develop the extensibility of the concrete in such a manner that it shall be able to elongate proportionately with the steel, yet without suffering absolute rupture.

Though concrete suitably reinforced is quite capable of being elongated by about ten times the amount that would cause the failure of plain concrete in tension, it is now established that the tensile resistance of the material is virtually destroyed at an elongation corresponding to a stress of about 5000 lbs. per square inch in the steel, by the development of cracks so small and so uniformly distributed as to be very difficult of detection. Therefore the tensile resistance of the concrete should be entirely neglected in practical designs, so far as concerns resistance to tension due to flexure. Nevertheless, the tensile resistance of the concrete is effective in withstanding secondary stresses representing the combined effect of flexure and shear; vertical shear being taken as a convenient measure of such stresses.

In addition to its employment in tension, with the object of developing the full compressive resistance of the concrete, steel is frequently applied in the compression area of beams and kindred members; but it is so applied only in cases where the proportion of steel in tension is greater than that necessary to utilize the full value of the concrete in compression. Consequently, the steel in compression merely acts as a kind of balance to the steel in tension; and as the neutral axis of a reinforced concrete beam is usually nearer the top than the bottom, the compressive reinforcement is far less economical than the tensile reinforcement. This point will be clearly realized from the statement that, owing to the usual position of the neutral axis, the stress that can be developed in the compressive reinforcement is only about two-thirds of that in the tensile reinforcement. Therefore steel in compression is applied to beams chiefly for the purpose of enabling the designer to keep the exterior dimensions within limits imposed by special conditions. Under ordinary conditions, all the tensile reinforcement that can be embedded in the lower part of a beam can be counterbalanced by extending the upper part so as to form a beam of T-shape.

Again, compressive reinforcement in columns is not economical in itself, so far as concerns resistance to direct compression, because the steel displaces a more economical material. But it must be remembered that long columns and struts are liable to flexure, and that the reinforcement in such members is both economical and necessary. Lateral or transverse reinforcement applied to columns in the form of ties, hoops, or spiral coils, is always economical and necessary, because it operates to resist the tendency of the concrete to extend laterally when under axial load, in accordance with the well-known Poisson's ratio—the lateral reinforcement being, of course, in tension.

Web reinforcement in beams, acting as a link between the centres of compression and tension, is of much importance, as it provides a safeguard against failure by tension on diagonal planes, resulting from flexure and shear. According to the most recent investigations, the shearing strength of concrete is from one-half to three-fourths of its compressive strength. Consequently, there is usually little risk of failure by shear. But the correct determination of shearing stresses is always necessary, for the reason that shear is taken as a measure of diagonal tension, which itself is of indeterminate character.

In addition to the application of main and secondary reinforcement of the kinds mentioned for beams and columns, the designer has also to dispose reinforcement suitably for resistance to reverse stresses near and over the supports of continuous beams, and to apply special reinforcement at connections between columns and beams, and between the rib and compression flange of T-shaped beams. Taking all things into account, it will be realized that the design of a very simple structure consisting simply of beams and columns involves a good many considerations. While published formulæ can be employed quite easily by anyone having a very moderate knowledge of mathematics, their correct application involves much more, and can scarcely be expected unless the designer is thoroughly at home with fundamental mechanical principles. When more complicated structures—especially those including problems relating to the theory of the elastic arch—are in question, the importance of sound engineering capacity is still more evident.

When reinforced concrete began to be general in this country about ten or fifteen years ago, the question of design was something in the nature of a mystery. At the present time, however, the fundamental principles underlying reinforced concrete construction are fairly well known, and there is reason for the belief that engineers will not be content to leave the work of design entirely in the hands of specialist firms. Nevertheless, the extended experience acquired by such firms cannot fail to be of value, and in many cases may be enlisted with economic and other advantages; the responsible engineer confining his attention to the preparation of general designs and the superintendence of the work.

### Practical Construction.

As the strength, stability, and permanence of works executed in reinforced concrete depend very largely upon the quality and

proper treatment of the materials, and upon the care exercised by workmen in their application, the points now to be considered deserve careful attention. In the preparation of concrete, the best grades of Portland cement should be used exclusively, complying with the revised British standard specification, and of the slow-setting variety. It is always wise to see that due provision is made for storing cement on the site in a shed or building affording protection from the weather, and from the communication of moisture from the ground. All sand used should be clean, free from earthy matter and vegetable substances, and should be composed of particles ranging in size from $\frac{1}{8}$-inch downwards. Aggregate should consist of pebbles or fragments of hard and durable stone. Coke and coal residues are inadmissible, because they contain sulphur and acids exercising a detrimental effect on steel. The aggregate should be well graded in particles ranging from $\frac{3}{4}$-inch down to $\frac{1}{8}$-inch gauge.

The scientific grading of sand and aggregate is of much importance; the idea being to provide particles assorted so that the voids are filled as far as possible. Then the remaining proportion of voids is filled by the cement, the quantity of which should be sufficient to bind the sand and aggregate firmly together, and to form a thoroughly compact and solid mass. Finally, the water used should be free from earthy and vegetable matter, acids, and alkaline substances in solution or in suspension. The proportion of voids in the sand and aggregate can be determined from time to time by filling either material into a water-tight box of known capacity, and measuring the bulk of water that can be added without overflowing. In thus gauging sand, care must be taken to see that it is dry before insertion, or else the results will be misleading.

As the weight of cement per cubic foot varies with the fineness of grinding and other causes, it is desirable that the quantity of cement should be specified by weight. The following proportions are those adopted for beams, columns, and floors by Messrs. Mouchel and Partners, a firm of engineers with very great experience of reinforced concrete work:—

| | |
|---|---|
| Cement . . . . . | One bag (224 lbs.) |
| Sand. . . . . | Four and a half cubic feet. |
| Aggregate . . . . . | Nine cubic feet. |

The consistency of the concrete should be such that the material will flow into all parts of the moulds, and between the bars of the reinforcement. All the constituents of the concrete, including the water required, should be carefully measured for each batch; and machine mixing should be adopted wherever practicable, owing to its greater uniformity and the greater strength of the product. Concrete should be mixed in quantities and at a rate just sufficient to meet requirements. Every batch mixed must be used before the temporary stoppage of work. If not so used, it must be thrown away, because concrete worked after it has once begun to set is of little or no value. Sample cubes of concrete should be moulded daily from material actually in use; the cubes being dated and marked for identification with different parts of the structure. The subsequent testing of the cubes will afford valuable and interesting data as to the quality of the work.

With regard to reinforcement, it may be said that, so long as the steel is of suitable quality, and is applied in parts of the construction where resistance is required to tensile, compressive, and other stresses, the precise form in which it is manufactured is not a matter of vital importance. Mild steel is generally the most suitable, and at the same time is the most economical, in view of the fact that in modern formulæ the ratio of the elastic moduli of the concrete and the steel is a governing factor. As the permissible stress in the reinforcement is limited by this ratio, and as the modulus of elasticity of high-tension steel is not appreciably greater than that of mild steel, the advantage of the former is not apparent.

In order to enable the steel to pick up the stresses to be resisted, the reinforcement should be in the form of small rods and bars. The smaller the bars, the greater is their efficiency in withstanding stresses and in promoting adhesion between the concrete and the steel. Various patented types of reinforcement—some of considerable merit—are now on the market. Some of these are in the form of bars made with indentations or other devices, with the object of providing a mechanical bond, and others are represented by varieties of network; one of the most valuable being the well-known expanded metal. While not wishing for a moment to say anything in disparagement of patented reinforcement, I may take this opportunity of pointing out that none of them constitutes a royal road to design, and however ingenious the reinforcement may be, the need for the judicious application of engineering principles holds good just as much as if ordinary commercial forms of steel are employed.

Assuming the steel has been delivered after proof that it has passed the tests prescribed by the British standard specification, the material should be sorted and stored so that bars of any size can be withdrawn for use with a minimum amount of trouble. All bars should be free from oil and grease; and loose rust, together with scale, should be removed by a stiff wire brush. A thin film of rust adhering to the surface does no harm, as the oxide of iron combines with the constituents of the cement to form a substance which arrests further corrosion. No bars should be welded; and any bending necessary should be done cold by the gradual application of force—preferably by means of one of the bending machines now available.

### Moulds and Timbering.

Coming, now, to the question of moulds and timbering for the formation of structural members, it should be noted that great care is necessary in the design and treatment of all temporary works of this nature. The timber should be neither too dry nor too green; otherwise there may be trouble from excessive swelling, or from leaky joints—the latter tending to cause cavities in the moulded work. Moulds and centring must be in proper alignment, and rigid enough to carry the semi-liquid concrete without appreciable distortion. Adequate strutting and bracing are important, and in open air work wind bracing must receive attention. Considerable saving of timber and labour can be effected by planning the moulds so that they can be readily taken down and re-erected for different parts of the work, or used again in subsequent contracts. Nails should be used sparingly, and, where unavoidable, left with the head slightly projecting; so that they may be drawn without injuring the timber. As far as possible, however, wedges and clamps should be employed.

Column moulds ought to have at least one side open, so that the concrete may be deposited in layers, and the opening filled in board by board as work progresses. If the moulds are made with all sides closed, as unavoidable in connection with some types of patented reinforcement, there is some risk that shavings, pieces of timber, and other foreign material may drop in and be incorporated in the concrete. Moreover, if concrete is poured into a long mould, there is a tendency for the aggregate to sink to the bottom and for the cement and water to be forced to the top.

Rectangular columns are usually moulded with chamfered edges, by nailing triangular strips of wood in the corners of the moulds. In cases where columns are connected with beams, the head of the column moulds is usually made with inclined surfaces on two sides, so as to form a knee-brace connection. Column moulds should also be designed so that the sides can be removed after the concrete has partly set, in order to allow the air to have access to hasten the process of setting; all weight being taken from the green concrete by means of struts. The sides of beam moulds should be attached so that they can be readily taken away as soon as the concrete has set hard enough to support its own weight; the bottom being left in position until the work is thoroughly seasoned. The sides should be clamped at intervals to prevent them from being pushed outwards; a camber of about 1 inch in 20 feet should be given to the bottom; and adequate supports must be provided to guard against deflection.

Horizontal slab centring should be laid with close joints; the boards being stiffened with transverse bearers, and the whole adequately strutted. It is a good plan to arrange matters so that the boards can be removed before the removal of the bottom boards of the beam moulds; the reasons for this being that the slabs have less weight to carry, and that they harden more quickly than the beams. Walls can be moulded either between shuttering built-up progressively with the addition of concrete, or else movable moulds can be employed, having clamps permitting them to be secured to the last section of wall completed, and moved upwards section by section.

If moulds are not used soon after erection, they should be examined and made good where shrinkage has occurred; and the wedges of the supports should be tightened-up as necessary. In warm weather the interior of the moulds should be wetted, to obviate absorption of water from the concrete; and the interior surfaces may advantageously be treated with limewash, soft soap, or oil, to prevent the concrete adhering to the timber.

The operation of laying-out and temporarily fixing the reinforcement is performed before concreting has been commenced in some cases, and simultaneously with concreting in others. The proper method of procedure for adoption depends upon the character of the reinforcement, the class of member to be moulded, and the nature of the design.

In the case of columns, it is desirable, for reasons already stated, that free access should be provided for the deposition of concrete layer by layer. This condition is not attainable if the lateral reinforcement consists of a continuous sheet of network with small meshes. All longitudinal bars in columns must be perfectly straight, and securely spliced if the bars are in more than one length. In the case of beams, the main and auxiliary reinforcement is generally built-up and securely wired together before the addition of concrete, in order to guard against accidental displacement of individual bars.

Whatever may be the manufactured form of the steel, it is of vital importance that the number, size, and position of all bars and other parts of the reinforcement shall be in exact accordance with the working drawings. Workmen do not always realize their responsibility in these respects. Therefore close supervision is necessary.

As work has necessarily to be discontinued each day, it is well to arrange beforehand the most suitable line along which horizontal work shall be stopped. In the case of floors and kindred work, the best plan is to stop the concrete with a vertical face at the middle of each span, where there is no vertical shear, and where the effect of compression is to press new and old work together. Before adding fresh concrete to material that has partly or completely hardened, the face of the old concrete should be roughened with a chisel, thoroughly cleaned, and covered with cement grout.

The removal of moulds and centring must be performed with great care, so as to avoid injury either to the work or to the timber. The time for which the moulds and supports should be

allowed to remain in position necessarily varies with the nature of the work, the weather, and the setting properties of the cement. The point is one requiring special attention in every case, and no timbering should be allowed to be disturbed or removed without direct authority from the engineer or someone responsible.

Before leaving the subject of practical construction, I may recommend that plans should be prepared in advance showing the positions of all pipes, electric cables, and fixings for mechanical plant, so that due provision for these may be made during the progress of work; thereby avoiding the undesirable practice of cutting into the concrete afterwards.

### Avoidance of Faults and Failures.

It would be easy to dispose of this part of our subject in a single sentence, for good design, good materials, good workmanship are the three essentials. If the engineer himself undertakes to prepare the designs, he will doubtless make absolutely sure that every detail has been thoroughly well provided for. On the other hand, if he limits htmself to the preparation of general designs for translation into terms of reinforced concrete by a specialist firm, he must be very particular to ascertain the precise qualifications of the firm selected. Again, if the undesirable practice of inviting competitive designs is followed, the various projects must be very closely examined, as under the stress of competition business firms are often tempted to make somewhat optimistic estimates regarding bending moments, stresses, and other factors.

Good materials can be ensured by the preparation of a sufficiently explicit specification, and by taking steps to see that it receives attention in every respect. Good workmanship can best be secured by insisting upon the employment of a contractor of good standing, who has had adequate previous experience of reinforced concrete construction.

Fortunately, it may be noted that there have been very few actual failures of reinforced concrete structures in this country, although a good many have happened in the United States, where undue risks are not infrequently taken. The most frequent fault is undoubtedly the premature removal of moulds. If any doubt exists as to the ability of the work to support its own weight, it is clearly wise to extend the time. To illustrate the unusual delay that may occur in the hardening of concrete, I may cite the case of a bridge which could not be opened for traffic until several months after the appointed time, owing to totally unexpected delay in the setting of the cement. In this case, the designer was a very experienced engineer, and misadventure was averted by his refusal to permit the centring to be struck until he had fully satisfied himself that such a course would be perfectly safe. I may add that the bridge has now been in regular service for a period of about eight years.

Three cases of bad design which have come within my experience are worthy of attention. In the first, a floor had been designed for an architect by a builder professing to understand reinforced concrete work. Three kinds of reinforcement were used in the main beams—small rolled steel beams, square bars, and a patented kind of bar. Some of the steel was placed where it was of no use; and on calculating the resistance of the beams I found that they were scarcely capable of supporting even their own dead-weight. It is not surprising, therefore, that the floor fell down as soon as the supports were removed. In the second case, a large building for industrial purposes was designed by a specialist firm without professional standing or experience in the difficult class of design involved; the result being that a large portion of the structure was blown down some time after completion. In the third case, a local architect, calling himself an expert, decided to omit some of the reinforcement shown in the working drawings prepared for him by a properly qualified firm of reinforced concrete engineers; the result being a somewhat serious collapse.

One or two cases of partial failure have occurred in this country owing to the misplacement of reinforcing bars by workmen; and a serious disaster happened in America in consequence of the fact that some bars were entirely omitted from one or two of the main columns in a large building. An examination of some structures which have been in existence for a few years has revealed the fact that reinforcing bars have occasionally been placed too near the outer surface of the concrete, and sometimes placed too closely together to permit the concrete to flow between them and around them. Such faults can, of course, be avoided by stringent supervision. Porous and honeycombed concrete has been found in a few instances; but the worst example of bad concreting comes from the other side of the Atlantic, where pieces of wood were found embedded in the concrete of a large column, and the concrete itself was of extremely variable composition because it had been poured into the top of long closed moulds.

So far as this country is concerned, the faults discovered in reinforced concrete work are comparatively trivial, and in number not more than those occurring in connection with other structural materials and methods. The instances I have cited are merely intended for general guidance, and must not be interpreted as showing that reinforced concrete construction is more liable to faults than any other class of constructive work.

---

[In conclusion, the lecturer invited attention to a series of views illustrating various kinds of structures which he hoped would serve the purpose of demonstrating the applicability of the material to the varied requirements of gas-works engineers.]

# RECENT IMPROVEMENTS IN GAS MANUFACTURE.

### A Review from an American Standpoint.

This was the subject of a paper read before the New York Section of the Society of Chemical Industry by Mr. Alfred E. Forstall. We have received from the author a print of his communication, and make the following extracts from it.

### Manufacture.

Dealing first with the manufacture of gas, Mr. Forstall called attention to the change effected in 1885 by the introduction by M. André Coze of his system of inclined retorts, and their substitution for those set horizontally, which had previously been in use. Though adopted quite generally in Great Britain and on the Continent, only three important installations, and not more than five or six minor ones, were made in the United States. Seventeen years later, two types of vertical retorts—intermittent and continuous—were brought to the notice of the gas profession. The first patent for the former type of retorts, which had been developed by Dr. J. Bueb, of Dessau, was taken out early in 1902, and the United Gas Improvement Company of Philadelphia began experimenting with intermittently filled vertical retorts about the year 1908. The German practice is to fill the retorts completely with coal; while the above-named Company leave 4 feet at the top empty, so as to provide a space in which the heavy hydrocarbon vapours may be converted into gas by the action of radiant heat.* Mr. Forstall pointed out that in 1880 Mr. C. F. Dietrich obtained a patent for the United States for a setting of retorts which were very similar to those constructed under the original Bueb patent. At that time, however, conditions in America were favourable to the manufacture of carburetted water gas, and the field for coal gas did not seem to warrant the trouble of developing a new method of manufacture. Consequently, apart from building one experimental bench, nothing was done by Mr. Dietrich to develop his retort.

While the works of the Germans in connection with vertical retorts was confined entirely to those charged intermittently, in England the design of these settings was approached with the idea of adapting them to continuous carbonization. In 1902, there was built at Exeter a setting of vertical retorts [the Settle-Padfield] into which the coal was charged at regular intervals, the length of which could be varied, in quantities ranging from 2 lbs. to 7 lbs. After being tried in several places in England, the use of these settings was abandoned. While this retort was being experimented with, Messrs. Woodall and Duckham were developing at Bournemouth another type of continuously charged and operated vertical retort; and simultaneously Messrs. Young and Glover were doing at St. Helens work which has resulted in the Glover-West system.

After his remarks summarized above, Mr. Forstall proceeded as follows: Shortly after, and partly as a consequence of, the successful introduction of intermittently charged vertical retorts, the method of operating horizontal retorts was substantially modified. This had been to charge such retorts with a layer of coal about 4 inches to 5 inches thick, leaving above the coal a large free space through which the gas passed to the mouthpiece and ascension pipe. The maximum charge for each of the 9-feet retorts with one end permanently closed, in general use in the United States, was from 340 lbs. to 350 lbs. of coal. The front end of the retort being enclosed in the front wall of the bench for a depth of 13 inches, almost a foot of the length was not effective for carbonizing purposes, and the weight of charge was not more than 45 lbs. and in many cases not above 40 lbs. per lineal foot of the effective portion. There had been some theoretical discussion of the advisability of more completely filling the retorts; but this had not produced any result in practice until the completely filled vertical retorts afforded an object lesson of the freedom from carbon and naphthalene troubles secured by reducing the extent to which gas was exposed to contact with the highly heated walls of a retort. In England, where the use of through retorts, or those open at both ends, was common, it was easy to change from the lighter charges to the heavier ones; but in the United States it was necessary to change to the use of through retorts instead of single-ended ones before the increase in the weight of the charge could be made, since where the coke must be drawn from the retort by means of a rake it is necessary to leave sufficient space above the charge to permit the free passage of the rake, while with the through retorts, from which the coke can be pushed, provision for the passage of the rake does not have to be made. The present practice, where through retorts are in use, is to charge about 70 lbs. of coal per lineal foot of the effective portion of the retort. When so charged, from 66 to 70 per cent. of the area of the retort is occupied by coal, leaving only from 30 to 34 per cent. of the area for the passage of the gas; while when weighing 40 lbs. to 45 lbs. per lineal foot of retort, the charge only occupies from 30 to 36 per cent. of the area. The expansion of the charge during the coking process makes the actual free space left in the retort still smaller in proportion for heavy charges.

The use of heavier charges resulted in a large increase in the amount of gas made per pound of coal, with a decrease in the operating difficulties caused by the presence of free carbon in

* Some recent modifications made by the Company in their vertical retorts were described and illustrated in the "Journal" for Jan. 27 last (p. 232). —Ed. J.G.L.

the gas and in the tar. In England the yield of gas, which formerly averaged only about 10,500 cubic feet per ton (2240 lbs.) of coal now averages nearly 12,000 cubic feet; while in one plant built in the United States—that at Worcester (Mass.)—the former average yield of 5 cubic feet per pound has been increased to 5·9 cubic feet. In other works in the United States which have adopted the heavy charges, the yields of gas have been increased about 10 per cent. as compared with those formerly obtained. This increase has not been accompanied by a decrease either in the illuminating value or in the calorific value of the gas per cubic foot, and has therefore resulted in obtaining a greater total illuminating value and calorific value in the gas from a given quantity of coal. The yield from the continuous vertical retorts is also greater than that formerly obtained from horizontal retorts operated with light charges; but in America it has not been so large as that obtained from the horizontal retorts now operating at Worcester, Mass.

Some analyses have been obtained of the gas made in each of two plants—one having horizontal retorts and the other vertical retorts of the Woodall-Duckham type. The horizontal retorts are operated with moderately heavy charges, which, however, do not come up to 70 lbs. per lineal foot of retort. These plants are under the same management, and the coal used is purchased from the same company and is presumably practically the same; so the analyses show to some extent the difference in the gas due to the difference in the method of carbonization.

| | Horizontal Retorts. Per Cent. | | Vertical Retorts. Per Cent. |
|---|---|---|---|
| Carbon dioxide | 1·44 | .. | 1·49 |
| Benzol | 0·67 | .. | 0·55 |
| Illuminants | 3·15 | .. | 3·98 |
| Oxygen | 0·48 | .. | 0·28 |
| Carbon monoxide | 4·75 | .. | 6·90 |
| Hydrogen | 51·36 | .. | 45·02 |
| Methane | 33·60 | .. | 37·33 |
| Nitrogen | 4·55 | .. | 4·44 |
| Candle power (Sugg "D" burner) | 13·60 | .. | 15·57 |
| Calorific value— | | | |
| B.Th.U. per cubic foot by calculation | 610·00 | .. | — |
| B.Th.U. per cubic foot observed | — | .. | 615·00 |
| Yield per pound of coal | 4·85 | .. | 5·39 |

The total illuminants run slightly higher, and there is much less hydrogen in proportion to the methane in the gas from the vertical retorts than in that from the horizontal retorts. The illuminating value of the gas from the vertical retorts is also higher, while the yield per pound of coal was 10 per cent. greater. During the period over which the analyses of the gas from the horizontal retorts were taken, very wet coal was being carbonized; and this may have affected the illuminating value and the yield of gas, which were lower during this period than the average for the preceding month. But even the averages for that month were lower than the results obtained from the vertical retorts, which, however, were those made during a test lasting eight days, and in regular working results have not been quite so good.

Comparable analyses of the gas made in the working-scale testing-plant at the gas-works in Birmingham, both in intermittent vertical retorts of the Dessau type (but apparently charged so as to leave a free space above the coal at the top of the retort) and in horizontal retorts, have been given by Dr. W. B. Davidson. They are given in the following table:

| | Dessau Verticals. Per Cent. | | Horizontals. Per Cent. |
|---|---|---|---|
| $CO_2$ | 2·4 | .. | 2·2 |
| $C_nH_m$ | 2·8 | .. | 3·4 |
| $O_2$ | 0·5 | .. | 0·5 |
| CO | 10·3 | .. | 9·7 |
| $CH_4$ | 28·0 | .. | 31·5 |
| $H_2$ | 51·0 | .. | 47·3 |
| $N_2$ | 5·0 | .. | 5·4 |
| Illuminating value, candles | 15·0 | .. | 18·0 |
| Net calorific value, B.Th.U. per cubic foot | 500·0 | .. | 525·0 |

*Note.*—The illuminating values given by Dr. Davidson cannot be compared directly with those given previously, since they were obtained from the "Metropolitan" No. 2 argand burner, and are probably about 3 candles higher than would have been obtained had the Sugg "D" argand been used, as was done in the other case.

Dr. Davidson observes that the gas made in the vertical retorts is deficient in unsaturated hydrocarbons and methane and high in hydrogen, and that a cursory examination of the analyses leads to the conclusion that the hydrocarbon gases are subject to more drastic degradation before leaving the retort in the vertical system than they are in the horizontal system, but that it is not unlikely that the gas suffers both in quality and volume by the escape uncracked of a larger proportion than usual of tar oil vapours.

Experience with the United Gas Improvement Company's verticals operated with a large free space above the coal seems to show that the provision of this space leads to an improvement in the illuminating and calorific value of the gas, which is obtained at the expense of the extra quantity of tar produced when the retorts are completely filled according to the strict use of the Dessau system.

As far as the quality and quantity of the gas are concerned intermittent vertical retorts of the Dessau system give poorer results than are obtained in horizontal retorts; while the intermittent verticals of the United Gas Improvement Company's type and the continuous verticals do not give any better results along these lines than properly operated horizontal retorts.

The improvements effected by the use of vertical retorts consist in a saving of labour in medium-sized plants in which it is quite impossible to work charging and discharging machinery for horizontal retorts to advantage, and in greater freedom from trouble caused by free carbon and naphthalene, while the sulphur compounds other than sulphuretted hydrogen are also produced in smaller amount. In addition, there is a saving in the ground space required, though it is necessary to go higher into the air with verticals. To these advantages the continuous vertical retort system adds that of practically complete avoidance of the smoke and steam emitted during the charging and discharging of either horizontal retorts or intermittent vertical ones.

The work recently done in determining the character of the products given off by coal subjected to distillation at different temperatures indicates that, from a gas-making standpoint, the greatest efficiency in the carbonization of coal could be obtained by so adjusting the heating of continuous vertical retorts that the temperature of the upper 2 or 3 feet of the charge should never exceed 1000° to 1100° Fahr.; while that of the lower portion of the charge would be carried as high as 1800° Fahr. By this method of heating, the rich hydrocarbons would be driven off from the coal without having to come into contact with very highly heated surfaces; while the gas remaining after these hydrocarbons were driven off, which is of such a character as not to suffer to any great extent from this contact, would be entirely expelled from the coal in the lower portion of the retort. In order to decompose the heavy hydrocarbon vapours, which would otherwise condense into tar, in such a manner as to convert them into the maximum amount of permanent gas mixed with hydrocarbon vapours that could be carried by the gas, with the setting free of the minimum amount of carbon, all the gas leaving the top of the charge should then be passed through a free space exposed to heat radiated from walls carried at a temperature adjusted to the rate of travel of the gas, but probably about 1400° to 1500° Fahr. This free space could be maintained either in the upper part of the retort or, if this leads to difficulty in feeding the coal, it might be entirely separate from the retort, and possibly be common to several retorts. This method of manufacture would increase the quantity and quality of the gas at the expense of the tar, and would not be advantageous unless the value of the gas gained was greater than that of the tar lost. It has never been actually worked; but, in my opinion, it is entirely feasible.

The recent improvements in connection with the manufacture of carburetted water gas consist in the devising and putting into general use of appliances for measuring the amount of air blown through the fuel bed during the "blow" or heating-up period, and the amount of steam passed through the fire during the "run" or gas-making period, together with the use of electric pyrometers for indicating the temperatures existing at selected points in the chequer brick of the carburettor and superheater of the type of apparatus most commonly employed in the manufacture of this gas. The use of these appliances makes it possible to determine, and to operate the apparatus constantly under, the conditions of blast, amount of steam used, and temperature to which the oil vapours are subjected which give the best results, and by so doing to decrease the quantity of fuel used and increase the efficiency of the conversion of the oil into oil gas, as compared with the former more or less hit-or-miss operation.

### Purification.

In dealing with the second division of his subject, Mr. Forstall began by referring to the Claus and M'Neill processes, the latter of which he described. He then passed on to consider the Hall and Papst process for removing carbon bisulphide, which has been in use in the Portland (Oregon) Gas-Works since 1908 for the treatment of about 3 million cubic feet of gas per day. In this process the gas is merely heated to a temperature of from 1300° to 1600° Fahr. by being passed through tall cylindrical vessels, formed of steel plates lined with fire-clay blocks and filled with chequer-work of fire-brick, which are heated by the combustion in them of fuel oil. The vessels are in pairs—one being in process of heating while gas is being passed through the other. The operations are reversed as soon as the vessel through which the gas is passing becomes cooled below the effective temperature. Under the effect of heat, the carbon bisulphide reacts with the water vapour present in the gas, and is largely converted into hydrogen sulphide, which is removed by passing the gas through an additional set of purifiers containing oxide of iron. He then proceeded as follows:

Another process which has been employed on a large working scale is that devised by Mr. E. V. Evans, and used since the beginning of 1913, to treat all the gas made—about 10 million cubic feet per day—at one works of the South Metropolitan Gas Company. This process utilizes the catalytic effect of nickel in accelerating the reaction between carbon bisulphide and steam, by which hydrogen sulphide is produced and carbon set free. The catalyst is in the form of balls, presumably of fire-clay, 1 inch in diameter, impregnated with nickel obtained by the reduction of the chloride in a current of hydrogen. These balls are contained in tubes having a length of 11 ft. 6 in. and a diameter of 6 inches, through which the gas to be treated is passed. Before reaching

the catalyzing tubes the gas goes through heat exchangers, or recuperators, in which it absorbs heat from the gas passing out from the apparatus, and then through preheating tubes in which its temperature is raised to 750° Fahr. With this preheating of the gas it is possible to carry on the process while maintaining a temperature of 800° Fahr. in the catalyzing tubes; and the principal direction in which the process has been gradually improved has been this preheating of the gas before it enters the catalyzers. A single combustion chamber, supplied with producer gas from an outside producer, furnishes the heat required by both the preheating and the catalyzing tubes. After about thirty days' use, it is necessary to stop the flow of gas through a set of catalyzers, and blow air through them, in order to burn off the deposited carbon, which is found to be, at times, 50 per cent. in excess of the quantity calculated from the amount of carbon bisulphide reduced to hydrogen sulphide. This carbon may be obtained from the decomposition of hydrocarbons in the gas; but analyses of the gas before and after treatment, as given below, show that the quantity so decomposed is negligible.

| | Gas Before Treatment. Per Cent. | | Gas After Treatment. Per Cent. |
|---|---|---|---|
| $CO_2$ | 1·82 | .. | 1·80 |
| $C_nH_m$ | 3·61 | .. | 3·79 |
| $O_2$ | 0·27 | .. | 0·07 |
| CO | 8·85 | .. | 8·62 |
| $CH_4$ | 26·62 | .. | 27·45 |
| $H_2$ | 52·45 | .. | 52·19 |
| $N_2$ (by difference) | 6·38 | .. | 6·08 |
| Illuminating power in English candles | 14·05 | .. | 14·05 |
| Calorific value. B.Th.U. per cubic foot | 590·00 | .. | 594·00 |

No information has been given as to the cost of operating this process; and though it does not require the maintenance of as high a temperature as is employed in the Hall and Papst process, it would seem to be somewhat more complicated and expensive, even though no loss of nickel be suffered.

Another process, which has only been tried at an experimental plant of the Heidelberg Gas-Works, consists in treating the gas, entirely freed from tar, ammonia, sulphuretted hydrogen, and carbon dioxide, with a compound of soda and cellulose obtained by the treating of cellulose sulphite with soda lye. The resulting material, after having been rolled and crumbled to a powder, is placed on trays in purifying vessels in the same way as oxide of iron. When brought into contact with carbon bisulphide, the soda cellulose is changed into cellulose xanthogenate or viscose, the raw material from which are obtained cellulose hydrate and the formyl-cellulose used in the manufacture of non-inflammable celluloid. In the experimental plant 10 tons of the soda cellulose material, known as "Athion," absorbed 1·25 tons of carbon bisulphide; so that with gas containing 45 grains per 100 cubic feet, 10 tons would purify more than 35 million cubic feet of gas. The cost of operation is not given.

A very promising process, which, however, has not yet been tested on a working scale, is based upon the fact that at temperatures above 100° Fahr. metallic iron acts as a catalyst that brings about and accelerates the reaction between bisulphide of carbon and moisture in illuminating gas. The fact that gas originally free from sulphuretted hydrogen contained this substance after having passed through a wrought-iron service-pipe which, because of running near a steam-pipe, was heated to temperatures varying between 90° and 158° Fahr., attracted the attention of Mr. J. G. Taplay; and a number of experiments made by him showed that at a temperature of 158° Fahr. the reaction between the bisulphide of carbon and moisture, with the formation of sulphuretted hydrogen, took place quite rapidly in gas travelling through a wrought-iron pipe, and also that as the interior of the pipe became rusted the sulphuretted hydrogen produced was absorbed by the oxide of iron, and did not show at the outlet of the pipe.*

A French gas engineer, M. Guillet, observed the same action taking place inside a gasholder, and by experiments determined that when gas containing bisulphide of carbon was passed through ordinary oxide of iron purifying material at temperatures above 25° C. (72° Fahr.) 25 per cent. of the original content of carbon bisulphide was removed. He found 100° C. (212° Fahr.) to be the temperature at which the change became rapid; while at a temperature of 130° C. (266° Fahr.) more than 67 per cent. of the bisulphide of carbon originally present was converted into hydrogen sulphide and removed as the gas passed through the material. The percentage removed increased with the amount originally present; the treated gas containing only from 3·01 to 5·82 grains, while the original gas contained from 9·48 to 24·42 grains of bisulphide of carbon per 100 cubic feet.

Since the efficiency of oxide of iron for the removal of sulphuretted hydrogen is very much increased by heating, and it should not be difficult to maintain the temperature of the purifying material at the comparatively low temperature of 250° Fahr., this process would clearly seem to offer the simplest and most inexpensive means of removing from illuminating gas the larger portion of the bisulphide of carbon which it still contains after the treatment ordinarily given to it in gas-works, whenever the amount of this impurity present is sufficiently large to make it important that it should be reduced.

* See "JOURNAL," Vol. CXVIII., p. 971.

# AMERICAN ILLUMINATING ENGINEERING SOCIETY.

### Eighth Annual Convention in Cleveland.

This meeting was held from the 21st to the 24th ult.; and, from the "Souvenir Programme" issued, it gave promise of being the most successful convention in the annals of the Society—not only because of the important papers which had been prepared but because of the proximity of interesting places which would prove of particular attraction to members of the Society.

As was pointed out, remarkable advances have been made in many branches of illumination during the past year, many of which were to be taken up at the convention. The meetings were divided into two groups—commercial and technical; so that members who could not stay during the entire convention or who were chiefly interested in only one of these two phases of illumination could choose the meetings which most closely touched their interest.

Pending the receipt of a more extended account of the proceedings, it may be mentioned that on the morning of Monday, Sept. 21, after addresses of welcome to Cleveland, the President (Mr. Charles O. Bond, of Philadelphia) delivered his inaugural address, and reports of the various Committees were taken. In the afternoon, three papers were read, synopses of which are appended. On Tuesday morning, Sept. 22, three papers were read; and, instead of an afternoon session, two lectures were delivered in the evening—occupying the time from 8.15 to 10.15. On Wednesday, Sept. 23, three hours in the morning and a similar time in the afternoon were occupied by both the Commercial and Laboratory Sections in the reading and discussion of seven and eight communications respectively. On the last day, Thursday, Sept. 24, three of the remaining papers were taken in the morning; and the business part of the programme was wound up by consideration of the last two in the evening. A very varied "Entertainment Programme" had been prepared; so that every minute not occupied by business matters could be devoted to sight-seeing in the city and surroundings.

### Synopses of Papers.

*Colour of Illuminants.* By L. A. JONES.

The author points out that colour determinations in dominant hue and purity have been made on a number of reproducible sources; and the variations in hue and purity of the carbon lamp, the Nernst, ordinary tungsten, and nitrogen-filled tungsten have been studied over a wide range of efficiencies. Data are given for rapidly standardizing these lamps by colour with a calorimeter.

*Artificial Daylight—Its Production and Use.* By M. LUCKIESH and F. E. CADY.

This is a review of the development of different methods of producing light of daylight quality, supplemented by reference to the experiments of the authors in producing such light from tungsten filament lamps by the subtractive method. A study of the requirements for different classes of lighting is included.

*Development of Daylight Glass.* By E. J. BRADY.

A short description is given of a research on coloured glass carried on with the object of producing a glass that will give the effect of average daylight when used with the Welsbach mantle or the tungsten lamp. Curves showing the percentage transmission of various glasses produced in a battery of small glass furnaces heated by gas, were included; and two instruments developed during the investigation were described.

*Relation of Light to the Critical Inspection of Documents.* By A. S. OSBORN.

This was a discussion of the conditions surrounding the examination of documents offered in evidence in court rooms. Proper lighting, it was urged, is necessary for showing points brought out in handwriting, typewriting, erasures, forgery, &c., to judges, referees, and juries.

*Planning for Daylight and Sunlight in Buildings.* By L. B. MARKS and J. E. WOODWELL.

The problems that come up in planning for daylight and sunlight in buildings were considered, and the state of the art of daylight planning was reviewed. Emphasis was laid on the hygienic and pathogenic value of daylight and sunlight in rooms, and on city planning for good day lighting. The problem of providing good day-lighting facilities was fully discussed with special reference to the New York Court House.

*Airshaft Illumination as Studied by Models.* By Dr. C. H. SHARP.

The paper presented the results of measurements on two miniature light-shafts, intended to show the illumination on the side of the shaft at different distances from the top, with various paints on the interior. The paints used were mat-white, enamel-white, chocolate colour, brick red, and black. The results gave

an indication of the rate of decrease of illumination in actual light shafts of similar relative dimensions.

*Photo Sculpturing and the Use of Light in the Production and Illumination of Sculpture.* By Professor JOHN HAMMOND SMITH.

In this lecture was given a description of a new method whereby a piece of statuary or other object may be photographed and images projected, to facilitate the accurate reproduction of the form in stone or other material.

*Colour Photography.* By M. C. RYPINSKI.

This popular lecture consisted of a short review of the history and development of colour photography, together with brief descriptions of the theory and general features of some of the more important processes. It was illustrated by numerous lantern slides.

*Locomotive Headlights.* By J. L. MINICK.

The differences were pointed out between the headlight laws of the various States. Four objects were stated as necessary of attainment in order that a headlight may fulfil all requirements. Results of various tests on arc, incandescent, gas, and oil headlights were quoted.

*Present Practice in the Use of Tungsten Filament Lamps for the Lighting of Metal-Working Plants.* By A. L. POWELL and R. E. HARRINGTON.

An outline was given of the systems of illumination in common use, with special reference to the question of reflectors; also a tabulation of the processes involved, with night photographs of typical plants. Average data taken from satisfactory installations were included.

*Factory Lighting—Cost, Maintenance, and Installation Data.* By O. R. HOGUE and A. O. DICKER.

This was a description of the practice of the Commonwealth Edison Company, with regard to factory lighting, giving valuable data covering the results of actual installations.

*Light Filters for Use in Photometry.* By Dr. C. E. K. MEES.

Eight new photometric filters, in two sets of four each, have been developed by the author for reducing colour differences in ordinary photometry, and are now available for photometric laboratories. Complete sets were exhibited by him.

*Some Experiments with Coloured Absorbing Solutions for Use in Heterochromatic Photometry.* By Dr. H. E. IVES and E. F. KINGSBURY.

The authors have developed reproducible solutions for eliminating the colour difference in photometric measurements. These solutions are of such a nature that by either changing the thickness or the concentration, any tungsten lamp can be made to match either a "four-watt" carbon or a pentane lamp. The authors gave an account of the many difficulties involved in the research.

*Characteristic Equations of Tungsten Filament Lamps and their Application to Heterochromatic Photometry.* By Dr. G. W. MIDDLEKAUFF and J. F. SKOGLAND.

This was a discussion of the use of characteristic equations in obtaining measurements on incandescent lamps from readings taken at approximate colour match with the comparison lamp. The characteristic relations were expressed by equations of the form $Ax^3 + Bx + C$; and it was shown that this relation is surprisingly accurate over a wide range of voltage.

*Transmission and Absorption Photometer for Small Areas.* By P. G. NUTTING and L. A. JONES.

The authors gave a description of a precision photometer for determining specular transmission or diffuse reflection in areas as small as 1 mm. square and (with a special ocular) as small as 0·1 mm. square.

*Recent Improvements in Incandescent Gas Lighting.** By ROBERT FRENCH PIERCE.

After classifying the opportunities for improving incandescent gas-lighting units, the author called attention to the fact that, while careful and exact studies have been made as to the mantle, little attention has been given in the past to development of burners, which has followed along lines of "cut-and-dried" methods. The author described the improvement which has resulted from scientific investigation of the burners—giving new cost figures.

*Characteristics of Gas-Filled Lamps.* By G. M. C. M'KAY.

This paper covered the radiation characteristics of various filament materials, and described the effect of introducing various gases within the lamp-bulb. The discussion covered the questions of efficiency, colour of light, &c., giving data.

*Lighting of Rooms through Translucent Glass Ceilings.* By EVAN J. EDWARDS.

This was a brief report of a study of the factors entering into the design of lighting systems for special rooms having ceilings of translucent glass, with the light sources placed above the ceiling. The results of photometric and other measurements on several sample glasses were set forth.

*Self Contained Portable Electric Lamps for Miners.* By H. H. CLARK.

The author submitted a brief historical review of the use of portable lamps in mines, leading up to the requirements for electrical portable lamps, as determined by the United States Bureau of Mines.

*Mixed Specular and Diffuse Reflection.* By P. G. NUTTING.

This paper was a critical discussion of the various methods of determining specular and diffuse reflection, occurring together; methods of specifying the data obtained; and the nomenclature of the subject.

*Notes on the Integrating Sphere and Arc Lamp Photometry.* By N. K. CHANEY and E. L. CLARK.

A review was given of the historical progress in the application of the integrating sphere, with mathematical deductions and computations. The practice of employing the sphere for the measurement of light production from various types of carbons in the laboratory of the National Carbon Company was described.

*New Standard Light Source.* By L. A. JONES.

This was a description of a proposed flame light source for photometric work—providing a convenient laboratory source, and giving a definite quantity of light of fixed quality.

*Some Tests of Possible Reflecting Power Standards.* By P. G. NUTTING, L. A. JONES, and F. A. ELLIOTT.

Determinations had been made by the joint authors of the absolute reflecting power of various reproducible, diffusely reflecting surfaces with which the reflecting powers of other surfaces may readily be compared.

*Uses of Light in the Treatment of Disease.* By Dr. E. C. TITUS.

Consists of a historical review and description of the present state of the art of applying the therapeutic effect of light by the medical profession.

*Experiments with the "Ferree" Test for Eye Fatigue.* By J. R. CRAVATH.

This was a description of experiments conducted by the author, especially with reference to office lighting, together with the data secured. It discussed the methods employed by Dr. Ferree and a modification of the method with which the author had himself experimented.

*Further Experiments on the Efficiency of the Eye under Different Conditions of Lighting.* By Drs. C. E. FERREE and G. RAND.

The paper described an extension of the work reported on at the last convention—covering more especially the various points brought out in the discussion. The effect of motion pictures, eye shades, &c., had been taken up.

*Visibility of Radiation.* By P. G. NUTTING.

New visibility data were given for twenty-one subjects, together with their mean, and a formula representing it. Determinations of the ratio of the international candle to the watt were given, and also precise data on the specific quality in candles per watt of various reproducible standard sources.

*Recent Experiments on Vision in Animals.* By H. M. JOHNSON.

A comparison had been made by the author of the visual acuity of animals and that of man. Determinations were made by the discrimination method, using two Ives-Cobb acuity objects as stimuli.

## PROGRESS IN ILLUMINATING ENGINEERING.

### Report by the Committee of the American Illuminating Engineering Society.

At the Eighth Annual Meeting of the American Illuminating Engineering Society, which was held at Cleveland (Ohio) from the 21st to the 24th ult., the Committee on Progress, of which Mr. F. E. Cady is Chairman, presented a long report reviewing the progress made in sixteen subjects closely associated with the objects of the Society. The following is an epitome of the report, so far as the portions specially interesting to "JOURNAL" readers are concerned.

In their introductory remarks, the Committee state that since their last report the developments in the science of illumination and in the lighting industry have continued to an extent which proves that there has been no lessening of public interest, and no cessation in the demand for improved lighting conditions. The detrimental effects of glare have been recognized, and an effort has been made to avoid them in the head-lights of automobiles The considerable increase in the intensities available in both gas and electric sources has made possible to a much greater extent than ever the use of diffusing globes and shades, and stimulated the demand for artistic fittings. The recognition of the scientific side of illumination has been growing, and there seems to be more and more of a tendency on the part of those who control the lighting of public buildings, stores, &c., both owners and architects, to take into account the principles which have been so faithfully promulgated by the Society. The Committee express

* Some extracts from this paper appear on p. 33 of to-day's "JOURNAL."

their appreciation of, and acknowledge with thanks, the data so courteously given by the engineers in charge of the lighting in the various cities, as well as by representatives of different manufacturing concerns who have cheerfully responded to requests for information.

The Committee proceed to deal in detail with the subjects comprised in their report. Taking first gas lamps and appurtenances, they remark that what is claimed to be one of the most important developments since the introduction of the incandescent gas-mantle lies in a new type of burner, by which the operating costs are practically reduced by one-half.* For residential work, very small mantles, giving approximately 30-candle power each, and considerably stronger than those of the old type, are used in clusters of three, so that in case of accident to one illumination is not completely shut off. Another innovation in burners utilizes experimental data indicating that in the bunsen burner of either the upright Méker type or the ordinary inverted form the highest temperature is immediately above the points of the small green inner cones. Use of the regenerative principle is made in a new burner for either high or low pressure gas. The high-pressure lamp using fused silica for the globe or cup has been further developed. It was described in the paper by Mr. George Keith published in the "JOURNAL" for April 28 last. A new method which claims to increase the life and light-giving power of mantles by dipping them into a solution of kaolin and permanganate of potash was referred to in the issue for the 17th of March. The question of the automatic gas-lighter continues to interest the inventor; but, though automatic ignition has found considerable favour on this side of the Atlantic, it has not gained much headway in America.

On the subject of street lighting, the Committee point out that the constant demand for better public lighting is reflected in the increase in illumination in some of the large cities in America during the past year; and they give a large number of instances. High-pressure gas lighting has made headway in England and Scotland. Glasgow has been extremely progressive in the direction of street lighting, as since 1895 there has been an increase in the number of gas-lamps from 13,672 to 106,684; while electric lamps have been introduced to the number of 5116. A pretentious programme has been started in Turin to improve the street lighting. The Committee remark that the general public are beginning to recognize the desirability of good lighting, as shown by the action of a club in one of the large cities appointing a Committee to investigate the question and make recommendations to the City Council.

Turning to interior lighting, the Committee state that the educational efforts of the Society are continuing to bear fruit. This is indicated in the illumination of a large department store, where the window-lighting system was worked out with foot and border lamps fitted with movable colour screens, so that the quality of the light could be altered to suit requirements. A novel application of the indirect lighting system has been made in the case of banks, where the lamps are contained in troughs along the rail over the tellers' desks. During an extended discussion before the British Illuminating Engineering Society on the subject of the daylight illumination in schools, it was brought out that, as a minimum actual illumination on the desk for reading in the schoolroom in full daylight, different authorities are recommending from approximately 1 to 8 foot-candles. In church lighting, there is a growing tendency to get away from the old belief that the interior of a church should be in a state of twilight illumination, and to realize that the building should be made cheerful, which can be accomplished by good lighting.

Taking up next the subject of photometry, the Committee direct attention to the further study which has now been made of the "flicker" photometer. Recent experiments have been carried out which indicate that the time element in the growth of colour sensations will explain the reason for weighting red light more than blue-green light when comparing the flicker with the direct-comparison method. On the other hand, a comparison, using the two methods, of two lights of the same resultant colour, one having a continuous spectrum and the other made up synthetically, gave the same result in both cases. With regard to light standards, the question has not been much discussed, and but little has been done in the direction of establishing the ultimate primary standard. In connection with photometry, the Committee mention a new instrument called a "glarimeter," designed to measure the relative glare or gloss of paper. An interesting test made with it showed that the effect of passing a sheet of unsized newspaper through the calendering rolls twenty-nine times increased the percentage of glare from 27·7 to 64·8.

After some remarks on the work of the Illuminating Engineering Societies and the International Illumination Commission, the Committee deal with the improvements which have been effected in globes, reflectors, and fittings. They remark that there has been a greater tendency in the design of the two former to have them adapted to architectural needs and particular classes of service. From an engineering standpoint, the most marked developments during the past year were those involving the use of semi-indirect fittings for both gas and electric lights, and particularly those which have accompanied the advent of the high candle power and high efficiency gas cluster lamps and the non-vacuum tungsten cluster lamps. In industrial lighting, there has been a noticeable tendency in the direction of the increased use of deep bowl reflectors. In street lighting, a prismatic refractor has been developed which gives a very extreme distribution of light; the candle power being highest at about 75° to 80° from the vertically downward direction.

In the domain of physiology, the relative hygienic effects of gas and electricity when used for lighting purposes have again been made the subject of an investigation. With respect to legislation, the Committee refer to the distinct progress made in England by the settlement last session of the question of whether the quality of gas should be judged on the basis of its calorific or its illuminating power. In America, the Wisconsin Public Service Commission had the matter before them some six years ago; while in New York the question is still under consideration by the New York State Commission, though it has been determined, as the result of an extended and very careful series of tests, that there is no definite law between the candle power and heat unit value of artificial gas. Hence it follows that in changing laws which specify candle power, the Committee say it will not be fair to adopt a specific factor to fix the calorific value from the value of luminous intensity. On Oct. 13, 1913, the results of the work of a Commission appointed to fix the units of light, heat, &c., were submitted to the French Academy of Sciences for recommendation before being put into law for France. The *bougie décimale* is proposed for the standard of light, defined in accordance with the recommendations of the International Congress held in Paris in 1889.

* In this connection, reference may be made to the paper by Mr. R. F. Pierce, given in the next column of the "JOURNAL."—ED. J.G.L.

# RECENT DEVELOPMENTS IN INCANDESCENT GAS LIGHTING.

By ROBERT FFRENCH PIERCE.

**[A Paper read at the Eighth Annual Convention of the American Illuminating Engineering Society.]**

Under the head of improvements come for consideration developments bearing upon—

I.—Initial efficiency of light production.

II.—Deterioration from initial efficiency and light output, either (*a*) inherent or (*b*) resulting from the factors usually embraced (more or less intelligently) under the head of "practical operating conditions."

III.—Maintenance: (*a*) Time. (*b*) Labour. (*c*) Convenience.

IV.—First cost per unit capacity as determining fixed charges—viz.: (*a*) Interest on investment. (*b*) Depreciation.

V.—Flexibility in adaptation, interchangeability of parts, &c.

## COMPLETE INCANDESCENT GAS LIGHTING UNITS.

In the case of incandescent gas-lamps, it is highly desirable to separate the permanent and the renewal elements, since each independently influences the performance of the unit from all standpoints. The necessity of this procedure is particularly apparent in considering depreciation due to obsolescence. In the case of an electric incandescent lamp of (say) 250 watts, the permanent element is the socket, costing (say) 11 c., and practically not subject to deterioration or obsolescence. In the case of an incandescent gas-lamp of corresponding capacity, the cost of one type of burner, which is the permanent element, is (say) $12. In the case of the electric lamp, the permanent part is practically negligible as regards the continued performance of the unit; in the case of the gas-lamp, it is highly important.

## BURNER AND ACCESSORIES.

*Burner.*—The burner is composed of a gas-orifice, air-ports for the admission of primary air, a raceway and mixing chamber (the latter fitted with gauze or a thermostat), a nozzle, and a suitable housing or shell. The gas-orifice determines, by its form and size, the velocity and air-entraining power of the incoming jet. It therefore influences initial efficiency, and, if subjected to fouling, subsequent depreciation. The raceway, mixing chamber, and nozzle are the most important factors in the design of incandescent gas-lamps. Their relative dimensions and form control the initial efficiency, and the gauze or thermostat, if subjected to fouling, may be responsible for considerable depreciation.

*Accessories.*—The glass cylinder or chimney, which is the only accessory necessary to the performance of the present type of lamp, is also of much importance. Its size, form, design, number and dimension of air-holes, &c., have considerable influence on initial efficiency; while deposits of dust or combustion products may cause great deterioration under service conditions.

A test to determine and separate the deterioration due to the above factors, and reported by the writer, showed that under the conditions of test the burner proper was responsible for a deterioration of (say) 2½ per cent. per 1000 hours, and the cylinder for (say) 10 per cent. The conditions of test were as nearly as possible like those of actual service, in which ordinarily clean gas of commercial quality is furnished at constant pressure. The air was very highly charged with particles of mineral matter, and the fouling of the orifice was undoubtedly much greater than would

occur in actual practice under any but the most extreme and unusual cases.

There were no gauzes in the mixing chambers; but a somewhat similar device, known as a "distributor," having a similar effect, was used. This device consists of a band of deeply corrugated metal bent into circular form; the axis of corrugation being parallel to the axis of the chamber. In one case the advent of a plague of mosquitoes resulted in the fouling of the distributors by their charred bodies, and produced a reduction of about 20 per cent. in candle power. This simply indicated the desirability of using air-port screens—a commercial device fitted to the lamps when ordered; and it obviously bore no relation to the ordinary performance of the lamps. There were a few cases of carbonization, the depreciation in candle-power amounting to from 20 to 25 per cent. It must be borne in mind that no adjustments were made upon the lamps for the period of test; and in this respect the conditions were more severe than those of actual service.

Carbonization is usually an indication of excessive fouling of the orifice or mixing chamber, or of the inability of the gas to entrain sufficient primary air to produce a non-luminous flame. Carbon trouble from the latter source is usually confined to inverted lamps—those in which the entraining jet is directed downwards—and may be corrected by adjustment. The upright gas-lamp will operate without adjustment over a much wider range in gas conditions than the inverted lamps, because of the better entrainment which provides a higher margin of primary air above the carboning point. From whatever cause carbonization really arises, its frequency and extent are greatly reduced by increasing the entraining power of the gas-jet at the orifice.

*Mantles.*—The tests mentioned above indicate that the deterioration in light output of the artificial silk mantle is in the neighbourhood of 2½ per cent. per 1000 hours; and among the twelve mantles used in the test, no failure or breakages occurred during the entire period of 5000 hours. The inverted mantle, by reason of the manner of support, is far more rugged and durable than the upright type.

## Prior Conditions.

There has been, and is being, a great deal of money expended upon research work in connection with gas-lighting appliances. Heretofore work of this character has been largely confined to the mantle. The reason for this is obvious. The initial difficulties were so apparently overwhelming as to bring an early realization of the fact that technical talent of a high order, and research and investigation of the most painstaking and extensive character, were absolutely essential to the development of incandescent gas lighting beyond the status of an interesting laboratory experiment. In fact, in the development of no other lighting appliance have the obstacles encountered and overcome been so formidable and refractory as those met with in the development of incandescent gas lighting. From this standpoint, it is by far the greatest achievement in illumination, ancient or modern.

On the other hand, the burner was of such apparent simplicity of design as to be considered scarcely worthy of attention. Recently, however, a reversal of position is seen to be necessary. The substances available for use in the mantle, and the manipulation needed to ensure the highest quality of product, appear to have been so thoroughly explored and investigated that the direction of future developments in efficiency, permanence, and mechanical strength is not even indicated.

Until the last two years, little was known of the behaviour of gas and gas and air mixtures in the bunsen burner. Not even empirical formulæ for burner design existed; and the development of a new burner was a cut-and-dried process—the best combination being selected without any knowledge as to whether a better one might be possible. Occasionally an exceptionally efficient burner was developed; but the reasons for its efficiency were so little understood that it was often impossible to duplicate, even approximately, the performance in other sizes. The general opinion prevailed that the inverted burner was inherently superior in efficiency to the upright, while as a matter of fact quite the reverse is the case; and the apparent superiority of the inverted burner was due to causes entirely unrelated to the burner itself.

## Research Work and Burner Requirements.

About two years ago the first serious research work on the bunsen burner as applied to gas lighting was begun. The difficulties in the way of securing positive knowledge concerning the processes carried on in the burner are numerous. Direct quantitative measurements of the principal quantities involved are extremely difficult with any of the means available at present. The forces and masses involved are indefinitely small, and the results of their interactions cannot be forecast successfully by deductive methods. In the line of investigation undertaken, it was attempted to establish certain observable criteria of burner performance which might be taken as at least indicative of the effects desired.

*Orifice.*—The object of the orifice is to permit the outflow of gas under conditions favourable to the maximum entrainment of, and most uniform admixture with, the primary air. The first investigations were conducted upon the orifice alone, without raceway or mixing chamber. Surrounding the stream of gas by vapour of ammonium chloride offered a simple means of observing its behaviour. It was found, however, that the form of stream when lighted at the orifice presented the same appearance as when unlighted and defined by vapour. Tests of actual burners also indicated that this criterion was a sufficiently useful one for practical purposes; and it was adopted for the preliminary investigation of orifices.

Tests of several complete burners in conjunction with observations of the lighted gas stream from the bare orifice indicated that the most desirable jet is one which when lighted presents the smoothest flame surface, and produces the least noise and the longest and narrowest pencil of flame. Unexpectedly enough, the best orifice for this purpose was found to be a small circular hole in a thin check, although deductive reasoning would indicate that, since the entraining power varies as the square of the velocity, it should vary as the square of the efflux coefficient of the orifice. It was found, however, that this form was suitable for only very small orifices. In larger ones, the annular form appeared to be most effective up to certain limits, beyond which a plurality of small orifices were required.

*Raceway and Mixing Chamber.*—Having determined the most suitable form of orifice, the raceway and mixing chamber were investigated. This investigation was necessarily of an empirical nature. Preliminary investigations were based upon the size and colour of the flame cone at the nozzle, this being an accurate indication of flame temperature.

Though it has been known for a long time that the dimensions and forms of these parts greatly influenced the performance of the burner, the tremendous influence of apparently insignificant modifications was most surprising. It would not be feasible to enter at this time into an extended discussion of the essential features of burner design as developed by these investigations. The experiments have, however, progressed to a point where the necessity for extreme refinement in design has become apparent, and the fundamental and essential features of raceway and mixing chamber design have been clearly indicated. These are as follows: (1) The gas-jet issuing from the orifice should be discharged along the axis of a straight raceway, the diameter and length of which will depend upon the quantity of gas flowing. (2) The raceway should discharge into the mixing chamber by a suitable taper. (3) Means should be taken to further the intimate mixture of air and gas by utilizing a portion of the kinetic energy of the mixture in such a manner as to promote thorough mixing. (4) The formation of eddy currents, or the useless absorption of the kinetic energy of the gas-and-air stream, is to be avoided.

The first and second features are necessary for the most effective entrainment of air and the delivery of the gas and air into the mixing chamber at maximum velocity. The third and fourth requirements present the more difficult problem, and play the larger part in the final result. In the present or ordinary type of burner, there is more or less stratification in the air-and-gas mixture; diffusion alone being insufficient to produce more than a very imperfect mixture. The limit of air entrainment, and hence the flame temperature, is therefore fixed by the most fully aërated stratum of mixture. This appears to be responsible for the low efficiency, sensitiveness, and occasional noisiness of the ordinary type of burner. On the other hand, if uniform mixture be effected by means which too greatly decrease the velocity with which the mixture is delivered from the nozzle, the limit of air entrainment is restricted to a comparatively low figure by the rate of flame propagation in the mixture.

## A Revolutionizing Burner.

The real problem, therefore, has been to secure thorough mixture of gas and air with the least sacrifice of kinetic energy. In fact, the principal problem of burner design may be said to be one of kinetic energy. The results so far secured are: (1) An increase in efficiency of from 50 to 100 per cent., depending upon the size of the unit. (2) The entire elimination of the necessity for enclosing glassware. (3) A burner which is practically non-carbonizing and noiseless under the most extreme conditions, and in which the effects of fouling are negligible. (4) Very inexpensive construction, of such flexibility that practically no limit is placed upon the design of fixture, and the capacity of units may be easily altered by changing simple and inexpensive parts.

The revolutionary nature of this development is clearly apparent. The most serious disadvantages under which the incandescent gas-lamp has laboured have been: (1) Excessive deterioration in light output, due largely to the narrow range in gas conditions over which a given adjustment could operate—a comparatively small variation in one direction producing carbon, and in the opposite direction noise or flashing-back. Small accumulations of dirt, either in the orifice or the gauze, produced the same effects as those changes in gas quality which were responsible for carbonization. (2) Necessity for frequent attention, due to the operation of the above cause. (3) Fouling of enclosing glassware. (4) Excessive initial cost of the permanent parts. (5) Lack of interchangeability of parts of different units, and lack of adaptability to the requirements of fixture design. The elimination of practically every factor entering into deterioration in light output and efficiency leads us to believe that the laboratory performance will be approximated in actual practice and throughout the mechanical life of the mantle.

The following table gives some of the more important comparisons between the old type of burner (200 lumens per cubic foot, consumption 4 cubic feet per hour per mantle) and the new (363 lumens per cubic foot, consumption 2·5 cubic feet per hour per mantle). The mantle in the old type of burner cost 35 c.; in the new type, 20 c.

*Operating Costs per Million Lumen-Hours.*

[Units of 200 M.H. C.P. approximate.]

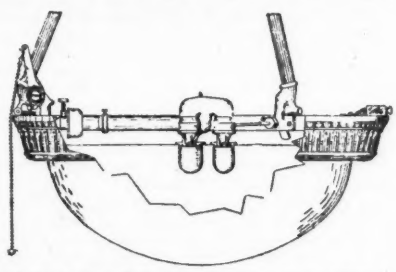
| | Old Type. | New Type. | Saving by New Type. Per Cent. |
|---|---|---|---|
| Gas, cubic feet | 5000 | 2750 | 65 |
| Mantles, based upon 1000 hours' life | $0.47 | $0.22 | 50 |
| Burner depreciation at 25 per cent. yearly (Hours Yearly.) | | | |
| 500 | 2.50 | 0.36 | |
| 1000 | 1.25 | 0.18 | |
| 2000 | 0.63 | 0.09 | 80·6 |
| 3000 | 0.42 | 0.06 | |
| 4000 | 0.31 | 0.045 | |
| Cost of pilot-lights; gas consumption, 1 cubic foot per hour each burning continuously; gas at $1 per 1000 | | | |
| 500 | 0.72 | 0.64 | |
| 1000 | 0.36 | 0.32 | |
| 2000 | 0.18 | 0.16 | 11·0 |
| 3000 | 0.12 | 0.11 | |
| 4000 | 0.09 | 0.08 | |

The net saving per million lumen-hours of the new type over the old in burning 1000 hours per annum with gas at $1 per 1000 cubic feet is thus:

| | Old Type. | New Type. |
|---|---|---|
| Gas | $5.00 | $2.75 |
| Depreciation | 1.25 | 0.18 |
| Renewals | 0.44 | 0.22 |
| Pilot-lights | 0.36 | 0.32 |
| | $7.05 | $3.47 |
| Saving | | 50·8 p. ct. |

It is quite unfortunate, from a commercial standpoint, that the new type of lamp, which cuts operating costs in half, cannot be given a distinctive name based upon some new principle of material involved in its production, in view of the fact that it parallels in the field of gas lighting the position of the nitrogen-filled tungsten lamp in the electric lighting field, except that the former is available throughout the entire range of commercial sizes. The saving in energy and material costs is, however, by no means the most important advantage of the new type. Dispensing with the chimney eliminates a deterioration in light output of at least 10 per cent. per 1000 hours, as well as the expense due to chimney breakage.

The wider range of operation without readjustment, and the use of a gauze of such wide mesh that no reasonable amount of fouling can affect the efficiency of the unit, make a great reduction in maintenance labour—the greatest handicap upon gas lighting. The previous type of burner required attention at comparatively frequent intervals, in order to maintain a satisfactory high efficiency. The extent to which this maintenance labour will be reduced in the new type will develop from the results of actual practice. It seems reasonable to believe, however, that this reduction should be at least 75 per cent., and probably greater.



**Section of Bowl of a Recently-Designed Gas-Lighting Fixture.**

The extreme simplicity of the new type, and its inexpensive construction extend its probable usefulness to a degree that can hardly be conjectured. The fixture shown herewith illustrates an effect in design heretofore practically impossible in connection with gas. The elimination of the bulky, unsightly, and expensive burner housing makes it possible to obtain practically any effect in fixture design required with a unit of from 60 to 1200 candle power and upwards in size. It is a simple matter to diffuse the products of combustion so that discoloration of the fixture is avoided and ceiling discoloration greatly reduced; or for a given ceiling discoloration the permissible minimum distance between lamp and ceiling is considerably decreased. This is accomplished by mica baffles, which, on account of the construction adopted, may be completely concealed from sight.

It is believed that this new type of burner practically eliminates all substantial objections to gas lighting (with the exception of those inherent in the pilot method of ignition), and will enable the engineer and architect to plan lighting systems practically without reference to the illuminants to be used.

**Masonic.**—The Provincial Grand Lodge of Warwickshire held their annual meeting at Coventry on Monday last week, when among the Provincial Grand Officers appointed was a Past-Master of the Murdoch Lodge—W. Bro. Charles Dakin, of Cradley Heath, who was invested as Assistant Deputy Director of Ceremonies.

# CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

## Welsbach Light Company, Limited.

SIR,—The report of the annual meeting contained in your issue of the 29th ult., while omitting—possibly from consideration of space—the weighty speech of Mr. Charles Lock (backed by a large shareholding and the whole of the debenture stock holding), records somewhat fully the observations of an anonymous "shareholder," who displayed remarkable and reiterated solicitude for the protection of the Company's English shareholders, against German interests.

In view of the present propaganda, promoted by people who have their own ends to serve, it is pertinent to note that this disinterested inquiry came from a gentleman in the employ of a competitive concern who, eleven days before the closing of the share registers for the annual meeting, obtained twenty-six Welsbach shares. So much so for the inquirer.

Now as to the inquiry and the suggested necessity for protecting the English shareholders against German interests. The reorganization of the Company early in 1911 is common knowledge in commercial circles and in the gas industry. It is well known that, at a time when the fortunes of the business were at a low ebb, the Company was reconstructed on a sound footing, and, as the result, has steadily and continuously advanced. The position of the German interests, then introduced, was as follows. They paid £100,000 in cash and guaranteed £240,000 in debenture stock, the whole of which cash and debenture stock the English shareholders received. In exchange, the German interests obtained 165,000 Welsbach shares, in respect of which they have never received a penny of dividend, and for which, as matters at present stand, they cannot receive anything whatever. Their present position is one of impotence; while the English shareholders are in a far better position than they were in before.

The British shareholders and stock holders, who number upwards of 3500 (whose aggregate holdings exceed £237,000 in shares and debenture stock, mainly the latter, which constitutes the primary and paramount security), do require some protection; but the protection needed is against insidious and interested attacks on the part of those who are seeking to damage, by means such as those described above, the fine business of this pioneer Company.

Let it be remembered that the Welsbach Company hold contracts from the British Admiralty, the War Office, His Majesty's Office of Works, Trinity House (Lighthouses), Woolwich Arsenal, and the chief British railways and municipal corporations and traders throughout the land. It also directly employs upwards of 800 British workpeople and staff, besides indirectly contributing to the employment of many hundreds of others; and it is on behalf of these interests that consideration is desired.

For the WELSBACH LIGHT COMPANY, LTD.
E. J. BUTCHER, Secretary.

344-354, *Gray's Inn Road,*
*London, W.C., Oct. 5, 1914.*

[With regard to the opening paragraph of this letter, making reference to the speech of Mr. Lock (in seconding a vote of thanks to the Chairman and Directors), it will be seen on looking at the report of the Company's meeting, on p. 732 of last week's issue, that the only remarks of shareholders recorded were those with which the Chairman specifically dealt in his reply to questions. It will also be seen that such remarks in all amounted to no more than five sentences (among three shareholders), and of these but two were credited to the "anonymous shareholder"—of whose identity the member of the "JOURNAL" staff who reported the meeting was unaware, as the name, if given at the time, did not reach him.—ED. J.G.L.]

## Calorific Value in Japan.

SIR,—Your suggestion which appears in a paragraph headed "A Calorific Standard for Japan," in the "JOURNAL" for June 30 (p. 1027), is read with thanks. As you say, the calorific value of our gas is fixed at 500 B.Th.U. per cubic foot. It was misprinted in our "Journal of the Imperial Gas Association" as "per 100 feet;" the printer and proof-reader carelessly misreading "cu." which resembles very much at a glance "100" in careless writing. I thank you again heartily for the notice.

S. INUBUSHI, Editor,
"Journal of the Imperial Gas Association."

*Tokyo, Aug. 27, 1914.*

# REGISTER OF PATENTS.

## Rotary Pumps or Compressors.

SELAS LIGHTING COMPANY, LIMITED, and TURNER, E., of Hulme, Manchester,

No. 26,604; Nov. 19, 1913.

This invention, relating to rotary pumps or compressors for air, gas, or liquid, has particular reference to apparatus in which a drum is mounted eccentrically within a casing provided with inlet and outlet ports and formed with radial slots in which blades are slibably arranged, so that when the drum is rotated each blade is moved radially outwards under the influence of gravity and centrifugal force as it approaches the suction or inlet port of the casing, and is forced inwards after passing the delivery port by the cam-like action of the interior of the casing upon the toe or exposed edge of the blade.

The chief object of the invention is to provide a blade which is comparatively thin, and therefore light, and has the necessary rigidity

imparted to it by corrugations, creases, ribs, beadings, indentations, or protuberances. The blades are preferably composed of thin sheet metal pressed or moulded into shape. The corrugations or the like may be arranged in parallel rows directed radially or otherwise, and in cases where they are not continuous from edge to edge of the blades, those of any one row may be staggered in relation to those of adjacent rows.

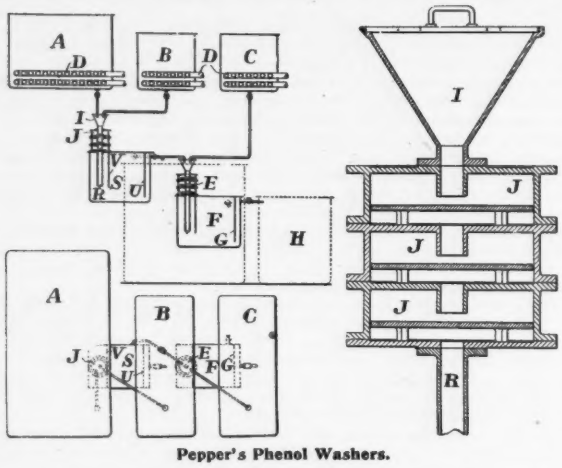
## Obtaining Phenols from Tar Oils.

PEPPER, A., of Tunstall, Stoke-on-Trent.

No. 20,077; Sept. 5, 1913.

This process for obtaining phenols from tar oils is one "which does not involve the use of any mechanical or power-driven apparatus, in which the phenols are very thoroughly absorbed, and whereby different qualities can be obtained simultaneously and a great amount of time and labour be saved in the process."

A sectional elevation of the apparatus is given; also a plan and a sectional elevation (to an enlarged scale) of one of the mixing chambers.




**Pepper's Phenol Washers.**

There are three chambers A, B, C—the first filled with the oil to be washed, while the others are filled with caustic soda of suitable strength; the oil and soda being heated to a suitable temperature for washing by a dry-steam coil D arranged in the bottom of each chamber. The tank A, containing the tar oil, as well as B, containing caustic soda, are connected by pipes controlled by valves with a tundish arrangement or conical vessel I arranged at the upper end of a mixing chamber J below the tanks containing the oil and soda. The tundish is closed by divided and easily removable covers fitted with handles. The oil and soda pass into the tundish and out through its lower contracted end to the interior of the mixing-chamber J, which, in turn, is fitted with a number of baffle-plates "arranged to cause a thorough mixing of the oil and soda." For this purpose, the baffle-plates are arranged so that the liquids will pass from the tundish over the outer edges of one plate, towards the centre of the chamber, over a second plate containing a central hole, and thence (in a similar way) over any number of plates to a pipe R at the lower end of the mixing chamber, and "discharging the thoroughly mixed liquids" into another tank or chamber S.

The separation of the oil from the carbolate takes place in the last-named chamber S, which is provided at one side with a certain plate or partition U depending from its upper end to within a short distance of the bottom of the tank, and arranged at the opposite side to that at which the mixed liquids enter the tank, though a further and similar partition V may be arranged near the pipe R. The oil flows through the upper end of the tank S through a regulating valve, and the carbolate passes upward behind the curtain plate U and through a regulating tap into a stock tank shown in dotted lines.

The oil on leaving the tank S is led into a second mixing chamber E, of somewhat similar construction to that previously described, except that it is composed of dished plates provided (if required) with serrated edges; the liquid passing through the tundish on to the dished plate, thence over its edge and on to a flat plate, through the latter, and so on according to the number of plates employed. Caustic soda from the third main tank C is simultaneously led into the second tundish by a pipe to the mixing chamber, "so that a thorough intermixture of the liquids takes place." The washed oil and soda solution containing phenols enters another separating chamber F below the second mixing chamber. The separation of the oil and carbolate takes place as before; the oil flowing to its receiving tank and the carbolate under the curtain plate G to the tank H as the washing is completed.

## Gas-Fires.

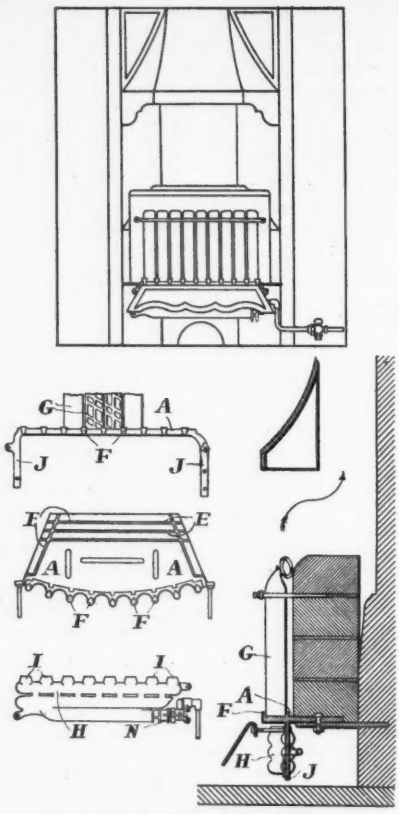
BARRETT, S. R., of King's Heath, Birmingham.

No. 984; Jan. 14, 1914.

The object of this invention is "to enable the conversion of any type of coal-grate into a modern gas-fire with vertical radiants, to be effected more quickly and easily, so that such an operation can be readily carried out by an ordinary gas-fitter."

The patentee remarks: "It is essential to the success of these fires that the burners and radiants shall be in correct alignment with each other, and that the radiants shall be in proper position with respect to the flames, and also that the gas and air inlet device shall be in proper relation to the burner. By mounting all these parts so that they form one unitary structure, so that although certain of them, such as the burner, may be removable, yet may only be placed in one set position in proper relation to the others, the difficulties hitherto experienced are, I believe, overcome. By supplying this one-piece structure to the fitter to be secured in place, the relations of the parts that mean the success or failure of the fire are correctly determined quite apart from his skill or lack of skill in the fixing,"

The illustrations show a front elevation of a converted fire carried out in accordance with the invention; a sectional view; a front view of the foundation plate with the depending brackets for supporting the burner; a plan thereof; and the burner and gas and air control device.




**Barrett's Gas-Fire Arrangement.**

The foundation plate A preferably consists of a plate adapted to pass over the usual ventilating grid of the coal-grate and to be secured to it. The plate is preferably formed with grooves, so that portions of it may be readily broken away to adjust it to any particular grate. The plate is formed integral with, or has secured to it, the usual shaped supports F for the radiants G. The bunsen burner H has in it apertures I (through which the flame emerges) placed at any standardized distance apart. The brackets J upon the foundation plate are provided so that when the burner is mounted in position it has a fixed and proper relation with regard to the fuel carrier; while at the same time its ready removal is permitted for cleaning purposes.

The method of attachment shown is to provide three lugs on one end of the burner and one on the other end, and to provide coincident screw holes in the brackets; or hook projections may be provided on the brackets on to which hooks or eyes on the burner may engage, or *vice versâ*. The gas and air mixing and regulating portion N of the burner may be screwed into it in the usual manner, and is secured to the foundation plate by two of the lugs above mentioned. In order to keep the vertical radiant (fuel) in position, a light fuel-retaining bar is employed, which may be retained by pins with flat anchoring pieces that may be built loosely into the fire-brick back of the converted fire.

## Treating Carbonaceous Material.

TOZER, C. W., of Victoria Street, Westminster.

No. 7117; March 20, 1914.

This invention, in the words of the patentee, relates to "the known processes employed for the treatment of carbonaceous substances both mineral and vegetable—such as all classes of coal, lignite, shale, peat, brown coal, wood, and the like—in a retort under specified degrees of heat and of vacuum."

The invention consists in varying the degree of heat and of vacuum in treating the substances so that "the recovery of tar, oils, and ammonia is effected in a more efficient manner, and the residue or coke is an exceedingly good fuel, embodying all the advantages of the original coal with none of the disadvantages—it being quite smokeless in burning, and ignites quite easily."

The coal or other carbonaceous substance is charged into retorts fitted with covers in such a way that they are hermetically sealed. The retorts are heated to a temperature of from 300° to 700° C., and at the same time are connected by suitable valves and pipes with exhausting apparatus capable of continuously maintaining an absolute pressure of 4·9 to 12·25 lbs. to the square inch (equal to a vacuum of from 20 to 5 inches of mercury). The products of the destructive distillation taking place in the retorts are passed through condensing apparatus in which the vacuum is maintained, and thence to an ammonia washer and an oil washer, so as to recover the oils, ammonia, and light spirits.

# LEGAL INTELLIGENCE.

## GAS COMPANIES AND THE REPAIR OF ROADS.

The two actions of the Gas Light and Coke Company *v.* Woodford Urban District Council, and Wanstead Urban District Council, in which the plaintiffs sought an injunction restraining the defendants from repairing certain roads in their district with reinforced concrete [as reported in the "JOURNAL" for Sept. 22 and 29, pp. 674 and 728] were again mentioned to Mr. Justice SANKEY, the Vacation Judge, on Wednesday last.

Mr. DIGHTON POLLOCK said the evidence was not yet complete; and it had been agreed that the actions should stand over for another week, subject to this, that in both districts defendants should be allowed to do about 300 more yards of work, without prejudice to any question.

Mr. NALDRETT, for the defendants, agreed to the adjournment.

His LORDSHIP accordingly ordered the actions to stand over for a week.

### A Fall over a Trench.

At the Eastbourne County Court, last Tuesday, his Honour Judge Mackarness heard a case in which Harry Adams sued the Eastbourne Gas Company for £52 12s. 3d. damages, for alleged negligence. It was stated that plaintiff (an assistant in a business establishment) on June 16 fell over a trench which had been made across the pavement in Cornfield Terrace; the fall being caused by the trench not being properly filled in. He had to leave business the same afternoon, and was confined to bed for a fortnight. Even now he felt the effect of the accident in his knee. At the time he was earning about £1 18s. per week; but he had since obtained a better post elsewhere. For the defence, it was urged that the plaintiff ought to have looked where he was going, and that he could not recover as he had been guilty of much contributory negligence. Evidence was also given by the employees of the Gas Company to the effect that the trench was in a perfectly good condition. Judgment was deferred until the 20th inst., for consideration of points of law.

# MISCELLANEOUS NEWS.

## ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

### Half-Yearly Meeting.

The Half-Yearly Meeting of the Alliance and Dublin Consumers' Gas Company was held last Wednesday, at the Head Offices, D'Olier Street, Dublin—Mr. JOHN MURPHY (the Chairman) presiding.

The SECRETARY (Mr. Francis T. Cotton) read the notice convening the meeting; and the minutes of the last meeting and of the special meeting which followed it were read and confirmed. The report of the Directors, which was given in the "JOURNAL" for Sept. 22 (p. 676), was taken as read.

THE CHAIRMAN'S SPEECH.

The CHAIRMAN, in moving the adoption of the report and statement of accounts, said he regretted that they were not of a more satisfactory nature. The report dealt so fully with the various matters concerned that all stockholders, having had it in their hands for a considerable time, must be fairly well acquainted with the present state of the Company's affairs. He trusted, however, that the remarks he was about to make would satisfy the stockholders that a great deal had been done during the six months under review towards improving the position of the Company. The profit for the half year, as compared with that for the corresponding period of 1913, was considerably down. This was accounted for by increased expenditure on coal and oil (£9131), and two exceptional items—namely, parliamentary costs £2195, and fees and salaries to experts £1896. There was also a decrease in residuals of £3651—tar £1506, sulphate of ammonia £2145. These figures gave a total of £16,873, from which must be deducted the increase in the receipts for gas, £5672, and a saving in various items of expenditure of £1068—say, together, £6740; making the net decrease in the profit £10,133, as shown by comparison of the revenue accounts.

PROFIT AND LOSS.

The profit and loss account on this occasion was altogether of an exceptional nature. In the first place, sundry accounts due by the Company and properly chargeable to previous half years had been overlooked in the accountant's department. These, amounting to £4096, appeared on one side of the account; while on the other side due credit was taken for a proportion of rates and income-tax paid in advance during the half year ending Dec. 31, 1913, amounting to £3747. The Directors had considered that it was advisable to establish a special reserve for discounts and bad and doubtful debts, and had allocated £5500 for this purpose. Towards this they were enabled to place a sum of £2698—an accumulated surplus on the gas-rental. Turning to three of the items on the debit side which were adjustments to the capital account, the first of these, £6604, referred to meters. For some years past the demand for dry meters had with them always been an increasing one; and these, as supplied, necessarily displaced a corresponding number of wet meters. A large accumulation of these wet meters had now been sold; and the capital had been credited with the difference between the original cost of the wet meters in question and the amount realized by their sale. The second item—viz., horses and carts, £3433—was also an adjustment to capital; the Directors having determined to sell the greater portion of the Company's horses and carts, largely substituting motor traffic, and contracting for any horse cartage necessary. In this instance also capital was now credited with the difference between the original cost of the horses and carts and the amount realized. The third item, £2048, was the cost of the alterations of the premises of the Company's show-rooms in Grafton Street, and depreciation on furniture and fittings. The other items in the profit and loss account spoke for themselves.

NEW CONSULTING ENGINEER.

The Directors considered the appointment of a consulting engineer, who would take in hand the reorganization and control of the works—to be an absolute necessity—and they had secured the services of Mr. William Newbigging. He (the Chairman) had much pleasure in stating how fully and thoroughly this appointment had been justified. Mr. Newbigging had had many difficulties to surmount, and the results of his appointment were seen in the satisfactory and uniform quality of the gas supplied, and also in the very great economies already effected, and those which he was continuing to effect on the works. The substitution of motors, and the contracting for carting work, which had been adopted, would result in considerable economy. He mentioned that Mr. W. F. Cotton, jun., the Engineer of the works, had sent in his resignation; and it had been accepted by the Directors. As to the coal in stock at the end of the half year, the Directors had decided to always maintain a substantial stock of coal, while, on the other hand, they felt that the quantity of sundry stores could with advantage in future be greatly reduced. To sum up, the works had been thoroughly and completely reorganized. The Directors regretted that this should have necessitated a considerable reduction in the number of men employed by the Company on the works and in the distribution department. This, however, was a matter of necessity. A considerable saving in wages had been effected without any loss of efficiency.

RETIREMENT ROTATION.

With respect to the resolutions to be submitted affecting the Directors, the first, arranging the rotation in which they should retire, was necessary in view of the number being now eight. It would be as follows, and would, he hoped, meet with approval:

> "That three Directors of the Company retire on the 31st of March, 1915; that two Directors retire on the 31st of March, 1916, and three Directors on the 31st of March, 1917. And, further, that this rotation be observed and continued as long as the number of Directors is fixed at eight."

As regarded the payment of expenses to certain of the Directors, the three gentlemen elected by the shareholders at the last half-yearly meeting resided in England. They had been most assiduous in their attendance, and he was bound to say their services in connection with the reforms that had been instituted—which he was confident would before long result in a very much improved condition of affairs—had been very valuable. In these circumstances, it was thought to be only reasonable that they should be reimbursed the outlay for travelling expenses incurred by them. A resolution to this effect would, as stated, be submitted for approval.

SUPERANNUATION FUND.

Touching on the paragraph in the report concerning the Officers' Superannuation Fund, the Chairman said the history of the fund was very fully set forth. It dated from so far back as the year 1878, since when sums of £500 had been set aside every half year. These items had always appeared in the half-yearly revenue accounts, and were passed by the shareholders at each meeting. The money so voted, however, had been invested in the names of three nominees—generally the Chairman, Deputy-Chairman, and Secretary of the Company—at present they stood in his own name and those of Alderman Cotton and Mr. Francis T. Cotton—and had not, till now, appeared in the balance-sheet of the Company. These allocations, together with the interest accruing on them from time to time, less the amounts paid out for gratuities and annuities, amounted now to £35,600, the sum standing to the credit of the fund. The payments made to officers of the Company out of the fund had always been fixed and arranged by the Board, and not by the parties in whose names for the time being the fund happened to be invested. The Directors were of opinion that the present amount of the fund, £35,600, was ample to meet any calls on it that might arise. They had, therefore, not allocated any sum to the fund during the six months under review, and did not propose to make any further contributions to it in future. Of this action the stockholders were asked to approve.

STEADY PROGRESS.

Having dealt at some length with the various features of the report which, in opening his remarks, he regretted were not more satisfactory, he gave some figures showing that, notwithstanding the exceptional disadvantages of the past six months, some steady progress had been made in the Company's business. There had been substantial increases in the prepayment department. The consumption had gone up by a little over 12½ million cubic feet, and the money by £3455; while the cost of collection had only been increased by £11 8s. 5d. The number of slot consumers during the six months had increased by 1454—that was, from 47,347 to 48,801; while the number of ordinary consumers had been fully maintained. As to the future, he did not wish to say too much. They were now meeting, as they all knew, in a very troubled and anxious time. The continuance of the war, and the consequent economy it would render necessary among consumers, would undoubtedly affect their receipts to some extent; but he was confident that the result of the current half-year's working would nevertheless show a decided improvement on the six months they were now dealing with. They had made an exceptionally favourable contract for oil for 1915 and 1916, and might, he hoped, expect lower prices for coal. Further economies would be developed on the works in other departments, and the present quality of the gas maintained. The accounts of the Company had been put on a thoroughly sound basis. All purchases, wages, and other items had been properly allocated. They were advised that some of the exceptional adjustments dealt with might have been spread over a period of half years; but they had thought it better to deal drastically with them once and for all, and start with a clean sheet. He really saw no reason why, with

the improvements that had been made, and those now being carried out, the Company should not rapidly attain a state of prosperity.

### No Balance for Dividend.

Mr. F. J. Dickens, in seconding the motion, expressed his great regret, which was shared by his colleagues, that the position did not admit of any dividend being paid. The Company numbered between 3000 and 4000 shareholders, many of whom were ladies; and it was inevitable that in some cases the passing of the dividend must, of necessity, cause a certain amount of hardship. Of course, the adjustments that had taken place in the accounts left no balance available from the half-year's earnings for the payment of a dividend; but, as they would see from the balance-sheet, the Company had a reserve fund which stood in the books on June 30 last at, roughly speaking, £40,000. The fund referred to was not a general reserve fund, but had been accumulated, and could be utilized for one purpose only—*i.e.*, the equalization of dividends. Under normal circumstances, it would have been possible to draw on this fund in order to pay a dividend—and, personally, he should have favoured such a course—but, unfortunately, the fund was almost wholly invested in outside securities, which would have to be realized in case it was drawn upon. He thought the shareholders would agree that to attempt any realization of the securities in the present demoralized state of the stock markets would entail such a sacrifice that it would be folly to attempt it. However, they had the satisfaction of knowing that the fund remained, and was there for another day, when more favourable conditions might prevail.

### Outside Investments.

He desired also to refer to the superannuation fund, which appeared in the balance-sheet for the first time. This fund, like the reserve fund, was invested quite outside the Company in first-class securities; but as a resolution would be proposed later on dealing with the fund, and as the Chairman had already referred to it, he would not enter into any details. He merely wished to remark, in passing—in order to remove any misconception that the notice might have given rise to—that it was not the intention of the Directors that superannuation benefits would be in any way discontinued. He was sure he was voicing the sentiments of the whole Board when he said that the Directors would always be prepared to recognize and sympathetically consider the claims of old servants of the Company for long and faithful service. Passing on to the accounts, he knew they would realize they had undergone a very thorough and searching investigation and adjustment; and to the best of his knowledge and belief they now had presented to them the actual position of the Company. The accounts spoke for themselves, and nothing had been held back. But if there was any point upon which any of them required further enlightenment, the Directors would be glad to answer any queries they might wish to make.

### Quality of the Gas.

He was afraid he would weary them if he had to attempt any detailed record of the many changes that had been instituted. It was to the works that they first turned their attention; for, as a business man, he held that the first axiom in success was to produce well and cheaply what they had to sell, and this was the aim of the Board. He was sure they would acquiesce with him in saying that it was highly desirable that the quality of the gas should be maintained at one uniform and regular standard; for, naturally, any fluctuations, either in quality or pressure, caused dissatisfaction and complaints. This was a matter to which great attention had been paid; and complaints on these scores had practically ceased during the past few months, and satisfaction had been generally expressed by the public at the improved state of affairs. That their endeavours in this direction were being appreciated was clearly shown by the large number of cookers and other appliances now being applied for and fixed; and consumers might rest assured that the utmost care was being exercised in the direction of maintaining the quality and sufficiency of the gas supply.

### Works Improvements.

The laying of a supplementary main from the City works to the gasholders on the Field site, as recommended by the Engineers in their report, was now being proceeded with, and would be brought into use as soon as possible; and this would further assist in the improvement that had been made. As regarded the works, he was able to report a greatly improved position. The cost of handling their raw material had hitherto been very heavy. This had been due, in part, to the position of the retort-houses, which were situated at a point on the site furthest away from the principal quay at which coals were received, and, in part, to indifferent organization of the men. Without incurring any capital expenditure, he was pleased to say that the cost of placing the coal into the coal-stores had been materially reduced by one-half; and, in order to still further reduce the cost, the Board had sanctioned the provision of coal-transporting plant on the Grand Canal Basin, at a cost of between £3000 and £4000. It was hoped that this plant would be in operation by the end of the year. As the Chairman had already told them, the Board regretted that the reorganization had compelled a reduction in the number of men employed by the Company in the works and distribution departments—a painful necessity to which there was no alternative; but it had been clearly proved that a greater number of men were employed than was absolutely necessary. He confirmed what the Chairman had stated—that a very considerable saving had been effected in wages during the current half year, without loss of efficiency. Summarizing the position briefly, the reorganization of the works had been thoroughly done, and its effect would be wholly beneficial.

### Stores Reduction.

On the other hand, they had taken steps to reduce the substantial amount of stores in other departments; for, as Mr. Murphy had told them, it was felt that the operations of the Company could be properly carried on with a smaller amount of capital than was represented in sundry stores, which stood at a figure of £17,660, and tar and other products £6041. He had already referred to two items of expenditure—the laying of the duplicate main to the gasholders and the provision of coal-conveying apparatus. These were the only items of capital expenditure so far as the works were concerned, and, in view of the already high capital per million cubic feet of gas sold, the Directors were fully alive to the necessity of reducing, rather than increasing, the capital account. This, of course, could only be done by their increasing the quantity of gas sold; and it was satisfactory to note that, notwithstanding the adverse conditions of the half year under consideration, the output had been so well maintained. In saying this, he was referring to the strike, which lasted until February, and the consequences of which were still felt. There was still ample scope for improvements and economies in other departments, apart from the works, and the Directors were giving these matters their careful and serious consideration. It went without saying, however, that all these changes could not be effected in a moment; and, though a good deal had been done in the last six months to improve the position of the Company, there still remained a lot of work in front of them before their programme was complete.

### Looking Forward.

He was always chary of prophecy—he would much sooner deal with accomplished facts; but he thought he was justified in saying that, had it not been for the terrible war in which the country was at present involved, the next balance-sheet would be much more acceptable, and a good deal more pleasant reading. For the months of May, June, and July, the sales of gas showed a steady and gratifying increase. Since, however, the beginning of the war, there had been a serious fall in the consumption of gas—an experience which was, he believed, common to other gas companies and municipal undertakings. This was easily understandable; for the natural explanation was that, in the presence of unemployment or diminished incomes, whereas people could not exist without food and clothing, they could, where necessity compelled it, exist without gas. Also, they were still working at old coal contracts, above to-day's price; and it would be some months before these were liquidated. There should be a good field in Dublin and the district served by the Company for extending the use of gas. The great improvements that had been made in the last two or three years in gas-fires alone, which were now so highly recommended by the medical faculty, offered an attractive avenue for development; and he took the opportunity of bringing the fact home to the people of Dublin that, as the "Lancet" said, there was now available a "method of domestic heating acceptable from the hygienic point of view." There must also exist in Dublin some small industries where the use of gas as motive power would be of great advantage; and he cordially invited inquiries from any of those so interested, as the Company were prepared to supply them with gas at a reasonable price, and, further, not only to guarantee uniformity in the quality, but regularity in the pressure. In conclusion, he impressed upon the shareholders that a great deal of useful and somewhat laborious spade work had been done during the last six months, and he asked them to possess themselves for a time in patience. He felt that, as soon as times became normal once more, their undertaking would be moving forward towards a return to its previous prosperity.

### Remarks by Shareholders.

Mr. G. W. Norman, referring to the passing of the dividend, said that surely they could pay some dividend notwithstanding the sliding-scale. In the case of the Cork Gas Company, which was a statutory concern, they were not allowed to pay more than 8 per cent.; but they had paid 1 per cent. out of the 8 per cent.

The Chairman pointed out that the Company referred to was a maximum Company; but their own Company was on a sliding-scale.

Mr. Norman asked if their revenue was able to pay 8 or 7 per cent., could they pay that? He understood they were a statutory 5 per cent. Company.

The Chairman: Oh, no. We are on a sliding-scale. The reserve fund is always available to supplement the dividend.

Mr. Norman asked if it were necessary to have the reserve fund.

The Chairman: We have power to accumulate a reserve fund, and then use it for the supplementing of dividends.

The report and statement of accounts were then unanimously passed.

### Matters of Procedure.

On the motion of the Chairman, seconded by Mr. W. H. Davies, it was unanimously resolved that three Directors of the Company shall retire on the 31st of March, 1915; that two Directors shall retire on the 31st of March, 1916; and three on the 31st of March, 1917; and that this rotation shall be observed and confirmed so long as the number of Directors is fixed at eight.

It was resolved, on the motion of the Chairman, seconded by Mr. J. E. Fottell, to approve of the payments made to three of the Directors for expenses incurred in attending the Board meetings of the Company—they being resident outside of Dublin.

Moved by the Chairman, seconded by Mr. J. L. Scannell, it was decided that the ordinary half-yearly general meetings of the Company shall be held on such dates during the last weeks of the months of March and September, respectively, as may from time to time be selected by the Board.

It was resolved, on the motion of the Chairman, seconded by Mr. R. S. Tresilian, that the action of the Directors in making no contribution to the Officers' Annuity Fund from the revenue of the half year ended June 30 be approved; and that notwithstanding the resolutions of the 30th of March, 1878, and the 30th of September, 1903, no sum be set apart annually for the purpose of the officers' fund.

Mr. John M'Bride proposed a resolution to the effect that the Directors "be authorized and directed, from time to time, and in such manner as they may think fit, to utilize and apply the fund known as the Officers' Annuity Fund created under resolutions passed on March 30, 1878, and Sept. 30, 1903, or the moneys or investments representing the same, for the general purposes of the business, and to take such steps as may be necessary for the purpose of rendering the fund available for such purposes."

Mr. Andrew Moore seconded.

The Chairman said this was a resolution that they could not accept. The fund referred to had been got together, with the sanction of the shareholders, for providing pensions for the officers of the Company; and the Directors did not think that they would be quite justified in

agreeing to the course Mr. M'Bride proposed. They would be reluctant that any idea should prevail among either the officers or stockholders that they were going to interfere with, or cut down in any way, the superannuation they from time to time deemed the Company's officers were deserving of. He moved, as an amendment, that the Directors be authorized to charge to the Officers' Superannuation Fund, in addition to the existing pensions, annuities, and retiring allowances, all future pensions, annuities, retiring allowances, and gratuities whatsoever, to officers, workmen, and their dependants, as they may from time to time determine. He added that the object of the Board in substituting this resolution for that proposed by Mr. M'Bride was to remove any misconception which might arise in the minds of the employees of the Company or the shareholders as to the treatment of the employees in future. He was sure Mr. M'Bride would be the very last to interfere with the allowances of officers in the future, and that he only wanted an explanation on his (the Chairman's) part for the carrying out of what was his (Mr. M'Bride's) wish. [Hear, hear.]

Mr. TRESILIAN seconded the amendment.

After some remarks by a shareholder, the amendment was put as a resolution, and carried unanimously.

The CHAIRMAN, in reply to a shareholder, said that the fund would appear in the balance-sheet in the same way as heretofore.

Mr. NORMAN inquired whether they had Counsel's opinion that there was no liability on the shares.

The CHAIRMAN: There is no liability on the shares.

VOTE OF THANKS.

A vote of thanks having been passed to the Chairman, the proceedings ended.

## NEW SHOW-ROOMS AT BRADFORD.

The Bradford Corporation Gas Department (of which Mr. Charles Wood is Engineer and Manager) opened yesterday week new extensive show-rooms at Nos. 21-23, Darley Street, Bradford. They are situated in a prominent position in the principal shopping thoroughfare of the city. The frontage is 40 feet, and there are five floors. Outside lighting is supplied by six of Keith's 1000-candle power high-pressure lamps.

The basement (which is provided with white tiles throughout) is fitted up as a hot-water chamber; there being fixed in working order six different makes of circulators, two storage tanks and circulators combined, three water-boilers for *cafés* or restaurants, four geysers, one hot-water towel-rail, and a greenhouse and garage heater. Various industrial appliances are also on show in this room, notably a high-pressure muffle-furnace, low-pressure melting-pot, dentists', tailors', and laundry appliances. The circulators and some of the industrial appliances are fitted on artistic iron stands, with white tiled tops. The room is lighted by Sugg's ventilating lamps, and heated by a Wilson "Sola-Warwick" fire in a tiled grate.

The ground floor is fitted up as a reception room, where all inquiries will be attended to. On this floor are displayed gas-fittings of every description by leading makers, and a large assortment of silk and beaded shades in mahogany and plate-glass show-cases. Two model gas-grates face the entrance.

The first floor is devoted to the general exhibition of cookers, fires, and pendants, while one end has been arranged as two model rooms. One of these is a model up-to-date bathroom, fitted with two geysers and a shampoo attachment, and an independent gas-heated towel-rail, together with one of the circulatory type. A model drawing-room adjoins the bathroom. This can be fitted up from time to time as a dining-room, bedroom, library, &c. Model gas-fire places have also been fixed on this floor.

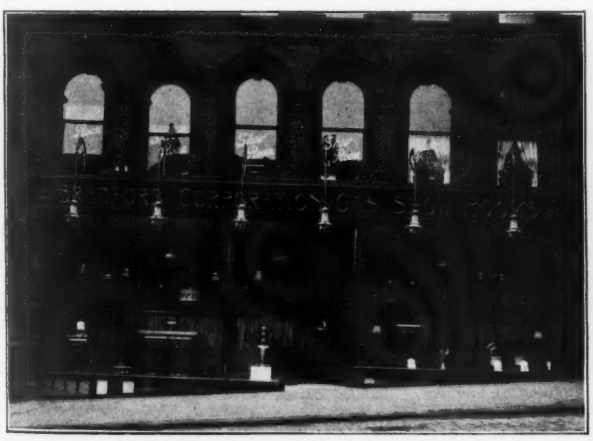
The second floor is designed as a demonstration room, with platform. On this platform has been erected an "All Gas" kitchen range by Messrs. Wilsons and Mathiesons. The demonstration room can be lighted either by a 16-burner Milne "Nonpareil" ventilating sunburner or by eight 300-candle power Graetzin lamps with beaded fringe attached. These lamps, like most of the model fittings throughout the show-rooms, are operated by pneumatic switches. Gas fires and cookers at suitable distances surround the room, as well as show-cases for silk shades.

A model kitchen has been fitted up on the top floor with cooker and fire, with fire-back boiler, in tiled recess; the fire-back boiler having as an auxiliary or as an independent heater a Wilson circulator. This being the type of kitchen fire most in use in Bradford, the application of the gas-heated circulator to it will, it is expected, be of considerable interest to the consumers. The remainder of the top floor has been fitted with stock cupboards; and an electric lift has been installed.

The ventilation of the whole of the building is carried out by two main flues, 18 in. by 15 in., which extend from top to bottom of the building, but which are not obtrusive. Extensive alterations have been necessary to make the buildings suitable for gas show-rooms; and these have been in the hands of the Chief Draughtsman of the Gas Department (Mr. Harold Higham). Mr. Sydney H. Packer is the Show-Rooms Manager.

[The photographs which are here reproduced were taken by Mr. H. Willmer, of the Bradford Corporation Gas Department.]

The Derby Lamp-Works, Limited, has been registered with a capital of £85,000, in 16,500 profit-participating cumulative preference shares of £1 each, and 274,000 ordinary shares of 5s. each, to carry on the business (*inter alia*) of manufacturers of electric lamps, filaments, and radiators of all kinds, stoves, meters, fittings, apparatus, and appliances connected with electricity, water, oil, gas, or otherwise.



The Exterior of the Show-Rooms.

First Floor, Showing one of the Model Rooms.

Ground Floor—The Reception Room.

Hot-Water and Industrial Appliances Chamber.

## REGULATED MANTLE PRICES IN BIRMINGHAM.

The Birmingham Corporation have taken a step which will be noted with satisfaction by their consumers, in announcing that, in order to prevent any unnecessary increase in the retail prices of mantles, they will be prepared to supply until further notice first-quality mantles (either upright or inverted) at 4d. each, and second-quality ones at 2½d. each. The trade will have no cause to complain, for the department add that any retailers of incandescent mantles who desire to sell mantles at these rates will be able to obtain from them approved quantities at wholesale prices.

When the war started, it is said, some of the vendors quickly rushed up to as high as 7d. the price of mantles which had previously been sold at 4d. It is, as they state, in order to counteract attempts of this kind to exploit the public that the Birmingham Gas Department have advertised the offer to sell at the rates named the considerable supplies of mantles which they have succeeded in securing.

## WIGAN CORPORATION GAS-WORKS.

### Annual Report and Accounts.

In his second annual report to the Chairman and members of the Wigan Corporation Gas Committee, the Engineer and Manager (Mr. Fred. Betley) says that in the year ended March 31 last there was about the usual increase in the number of consumers, while the increased output had been very encouraging. The further rise in the price of coal, with a reduced revenue from residuals, had had a marked effect on the profits; and it was unsatisfactory to note that the slump in coke continued, and the price of sulphate of ammonia was still falling. The unaccounted-for gas was a little higher than for the previous year; but the figure might still be considered satisfactory, having regard to the trouble experienced with damaged mains and services resulting from subsidence of the ground. At the beginning of the year there were on the register 13,085 ordinary consumers, and 10,764 prepayment; and at the end of the year the figures were 13,129 ordinary and 11,463 prepayment. The total increase in the number of consumers for the year was just over 3 per cent. In the same period, the number of cookers in use increased by nearly 6 per cent.—from 2069 to 2197.

There were 40,419 tons of coal and 108,085 gallons of gas oil used in the manufacture of 514,619,000 cubic feet of gas; the increase on the preceding year being 23,011,000 feet, or 4·47 per cent. The consumption of gas for all purposes last year was 482,614,600 cubic feet, of which 57,774,500 feet was used in the public lamps. The quantity utilized for cooking, heating, and motive power is given as 81,107,200 cubic feet. The make of gas equalled 11,425 cubic feet per ton of coal carbonized; and the percentage of gas unaccounted for was 6·21. The gross profit on the year's working was £28,238, and the net profit £4108. In addition, gas to the value of £5600 was supplied free for public lighting within the borough, which gives a total of £9708 as the real net profit for the year. This compares with £12,848 for the previous year, when coal was 1s. 1d. per ton cheaper, and the revenue from residuals was 1s. 1d. per ton of coal more.

## FORFAR CORPORATION GAS UNDERTAKING.

### The Annual Accounts.

The abstract of the accounts of the burgh of Forfar for the year ended the 15th of May last, which have lately been issued, includes, of course, those of the gas undertaking, which furnish the following particulars.

The amount received on capital account at the close of the financial year was £24,187; and it had been disposed of as follows: Purchase price of the undertaking as acquired by the Town Council (annuities of £675, at 22½ years' purchase), £15,187; expenditure by the Town Council, £9000—total, £24,187. The revenue account shows that £7126 was spent on the manufacture of gas, £677 on its distribution, the proportion of the general administration was £141, and the total expenditure was £9664. On the other side of the account, the sale of gas produced £7044, residuals brought in £2988, and other items of revenue made up a total of £10,569. There was consequently a balance of £905 to go to the net revenue account. This added to the amount in hand at the beginning of the year (£371), and a small sum for interest for consumers' deposits made a total of £1278. The charges for annuities, interest, depreciation, &c., came to £1320; so that there was an overpaid amount of £42 at the close of the year. The sum set aside for depreciation was £100; and in the course of his report on the accounts, the Auditor (Mr. T. H. B. Rorie) expressed the opinion that this was inadequate. He considered that a fixed percentage on the value of the plant and machinery should be charged each year for depreciation. For the two preceding years the amounts allowed were £251 and £325 respectively. During the past year, the cost of repairing the gasholder and station meter (£292) was defrayed out of the depreciation fund; and payments amounting to £219 were made out of the contingent fund in respect of new plant and mains.

The statistics relating to manufacture show that 6045 tons of coal were carbonized during last year, at an average cost of 18s. per ton, and that the production of gas was 59,611,300 cubic feet, of which 54,360,600 cubic feet were accounted for. The loss was 5,250,700 cubic feet, or 8·8 per cent. The make per ton was 9861 cubic feet. Compared with the preceding year, there was an increase of 861 cubic feet in the quantity of gas produced per ton. The earliest figures on the statistical table are for the year 1904-5, and they stand as follows: Tons of coal carbonized, 3572; total make of gas, 35,058,700 cubic feet; accounted for, 31,092,387 cubic feet; unaccounted for, 3,966,313 cubic feet, or 11·3 per cent.; average make per ton, 9815 cubic feet.

## LEICESTER GAS AND WATER SUPPLY.

The Gas Committee reported at the quarterly meeting of the Leicester Town Council last Tuesday that the accounts of the undertaking for the half year ended June 30 last showed that the net profit, after paying interest, was £17,609. Deducting £8204, the half-yearly payment to the sinking fund, and in part payment to the Public Works Loan Commissioners, a balance of £9405 remained to be applied, at the end of the financial year, as the Council might direct. The Committee also reported that, in order to assist in finding employment for men during the continuance of the war, the following works had been authorized to be put in hand when necessary: (1) The dismantling of the horizontal retort-settings at the Belgrave Gate works, and conversion of the retort-houses into coal and coke stores; and (2) the extension of, and alterations to, the pitch-beds at Aylestone Chemical Works.

In moving the adoption of the report (which was agreed to), Mr. Hilton remarked that the net profit of £9405 compared with £15,801 for the corresponding half of last year. They would have a difficulty in getting rid of their residuals, and there would possibly be a reduction in the consumption of gas.

The report of the Water Committee (which was also adopted) stated that the accounts of the undertaking for the six months showed a deficiency of £12,763, after paying interest and the half-yearly instalment of the sinking fund, and also after meeting the demands of the Derwent Valley Water Board.

Mr. Parsons pointed out that they were at present engaged in the entertaining operation of converting the annual loss on their trading account of over £30 000 into a profit. The revenue was £2491 more than during the corresponding half year. The deficiency was £12,763; but on the whole they had done better to the extent of £3239, as compared with a year ago.

## THE PARTIAL BREAKDOWN AT WARRINGTON.

The *agenda* for the next meeting of the Warrington Town Council contains a reference to the recent partial breakdown of the Corporation gas supply. The official explanation is as follows:

> The General Manager reported a reduced supply of gas on Sept. 12 and following days. It was necessary to make alterations in the retort-house for introducing power machinery. This alteration has caused serious trouble with the retort-house ascension pipes and mains. Owing to 32 of the men having joined the Colours, we were unable to obtain experienced men to cope with the trouble, and this led to a stoppage. The very hot weather caused an increased demand for gas, and made the work in the retort-house more arduous, and several men left in consequence.

Mr. Osborne has given notice that at the same meeting he will ask the Chairman of the Gas Committee the following questions:

1.—What sums have been paid for income-tax for the years 1912, 1913, and 1914? (*a*) Deducted from annuities and loans; (*b*) deducted from profits.
2.—(*a*) What is the charge for gas for street-lighting purposes? (*b*) When was the last reduction?
3.—(*a*) What was the average price paid per ton for coal during the year ended March 31, 1914? (*b*) What was the price charged for same at stocktaking?
4.—Is the department, or has it been, a member of a ring to keep up the price of coke?
5.—(*a*) Is it the intention of the Committee to open depôts for the supply of coke to ratepayers? (*b*) If so, when?
6.—What were the reasons for the abnormal expenditure of £6930 on "works and plant, repairs and maintenance" in the year ended March 31, 1914, when, according to the Manager's report, June, 1913, "the gas buildings and manufacturing plant have been kept in a good state of repair"?
7.—How much of the sum of £6930 was spent on (*a*) new works and plant? (*b*) repairs and maintenance.

## TODMORDEN GAS DEPARTMENT.

In a letter received from Mr. F. V. Barnes, the Engineer and Manager of the Todmorden Gas-Works, he points out that the statement from a correspondent regarding the past year's working of his undertaking, which was published in last week's "JOURNAL," does not set forth the facts of the matter. These are as follows.

In contradistinction to the electricity undertaking of the Todmorden Borough Council, which discloses a deficiency if £1143 on the past year's working, the Gas Department have earned a profit of £1141. The profit for the previous year was £1151. The increased cost of coal on the past year's working amounted to £1446. This, it will be seen, is greater in amount than the previous year's profit; and in spite of this large increase in the cost of coal, the department have been able to maintain their net profit at practically the same figure as last year. The gross profit on the twelve months' working was £7321, compared with £7343 for 1913. The total available for distribution was £6210. This has been dealt with as follows: Capital expenditure £729 paid out of revenue, in lieu of raising further loans. Transferred to the district fund £1462. This is again transferred from the district fund to pay off the deficit on the electricity undertaking—*i.e.*, £1143, *plus* £3·19 capital expenditure, in lieu of raising further loans. This leaves a balance of £4019 to carry forward.

The gas reserve fund remains at £5000, and is invested, The loans outstanding on the undertaking on March 31, 1914, totalled £127,668; and a sum of £15,482 remains in the sinking fund as yet unapplied in the repayment of the debt—thus making the net loan capital £112,186, as against £115,087 for the previous year.

## ENEMY PATENT RIGHTS.

### List of British Patents Granted to Germans and Austrians.

By virtue of the provision of the Patents, Designs, and Trade Marks Act (Temporary Rules), 1914, any person may—as has already been stated in our columns—apply to have any of the hereunder patents connected with lighting or heating revoked or suspended, providing that such person applying can satisfy the Board of Trade, or any person they may appoint for the purpose, that the patentee or licensee is the subject of a state at war with His Majesty, that such person applying intends to manufacture, and that such revocation is in the general interests of the country or of a trade. The list has been compiled for us by Messrs. Hughes and Young, Patent Agents, of 55-56, Chancery Lane, London, W.C., who will be pleased to give readers any further information they may require.

992 (1913).—Schanzenbach, G., "Lamp globes and reflectors."
4,843 (1913).—Apparate-Vertriebs-Ges., "Gas-regulators."
5,108 (1913).—Rehman, H., "Gas-producers."
5,124 (1913).—Deutsche Gasglühlicht, "Gas-cocks."
5,228 (1913).—Luders, A., "Lamp-pendants."
5,365 (1913).—Schlick, O., "Lighting burners."
5,723 (1913).—Worringen, C., "Blowpipe-burners."
5,949 (1913).—Genssen, H., "Treating water."
6,133 (1913).—Friedlander, H., "Safety gas-cocks."
7,377 (1913).—Braunstein, B., "Ornamental lamps."
9,499 (1913).—Wade, H., "Gas-producer plant."
9,678 (1913).—Schmidt, L., "Burners."
10,814 (1913).—Schiller, E., "Lamp brackets."
11,178 (1913).—Enderlein, K., "Lighting burners."
11,616 (1913).—Wigaud, A., "Heating water."
12,238 (1913).—Garrecht, F., "Supporting lamps."
12,482 (1913).—Lucas, P., "Vapour burners."
12,699 (1913).—Behl, A., "Gas controllers."
12,774 (1913).—Hildebrandt, G., "Blowpipe-burners."
12,808 (1913).—Akt.-Ges. fur Selas-Releuchtung, "Liquid fuel burners."
20,833 (1912).—Schnabel, M., "Liquid fuel burners."
20,935 (1912).—Arndt, M., "Liquid meters."
21,355 (1912).—Ehrenreich, K., "Vapours for crude burning."
21,359 (1912).—Zimmermann, W., "Gas manufacture."
21,465 (1912).—Alt, K., "Water-heaters."
22,549 (1912).—Schanzenbach und Co., "Supporting lamps."
23,298 (1912).—Kaestner, F., "Lanterns."
23,656 (1912).—Liese, H., "Fluid-meters."
29,654 (1912).—Hoeller, W., "Gaseous-fuel burners."
29,371 (1912).—Koppers, H., "Discharging retorts."
29,998 (1912).—Deutsche Licht Industrie Ges., "Incandescent gas-burners."

## COAL-TAR DYE INDUSTRY OF GERMANY.

### Practicability of its Transfer to America.

A short time ago our American contemporary "Metallurgical and Chemical Engineering" submitted to certain prominent gentlemen connected with the chemical industries of the United States a series of questions in regard to the effect of the European War on the continuity of operations by the cutting-off of the supply of raw materials. One of the questions was as follows: "Will the forced industrial restriction in Europe, if it continues long enough, warrant the development in this country [America] of chemical industries which have so far been almost exclusively European? What are the possibilities of an American coal-tar industry?"

Dr. W. H. Nicholls replied to the question as follows: The prospects of the American coal-tar industry would depend upon the encouragement which the buyer gave to the manufacturer. The experience of the Benzol Products Company, which started in a small way to manufacture aniline oil, was that, though a tariff of 10 per cent. was placed on aniline oil by Congress, foreign manufacturers reduced the price to a point at which it was impossible to compete.

Mr. W. J. Matheson said: In regard to intermediate products—such as aniline oil, aniline salts, beta-naphthol, paranitraniline, &c—the industry is already developed, and its growth depends in large measure upon the supply of cheap benzol.

Dr. L. J. Matos said the question was, primarily, whether they produced enough coal tar to make them independent of any foreign source of tar, and also whether higher prices could be obtained for certain tar distillates than the colour industry could afford to pay. It was not so much a question of the inability of chemists to produce dyes, but of the temporary handicap of not having the especially designed and constructed appliances for the proper conduct of the technical operations in elaborating the several raw materials to middle and ultimate products.

Dr. Bernard C. Hesse replied at length; his remarks being as follows. In the coal-tar industry the following three divisions may be made for convenience and clarity: (I.) Products from coal tar by distillation, expression, and like operations. (II.) Products obtained from Division I. by chemical transformation, but not themselves dyes. (III.) Dyes made from Division II. According to what purport to be official figures, Germany's foreign trade in 1913 in these three classes was as follows (in metric tons):—

| Division. | Imports into Germany. | Exports from Germany. | Excess of Exports over Imports. |
|---|---|---|---|
| I. | 67,501 | 342,893 | 275,392 |
| II. | 673 | 16,311 | 15,638 |
| III. | 3,238 | 163,874 | 160,636 |

Obviously Division I. need not be further considered. As to Division II., the German figures are given in three subdivisions: (*a*) Aniline oil and salt; (*b*) naphthol and naphthylamine; (*c*) anthraquinone, nitro-benzol, toluidine, resorcin, phthalic acid, and other coal tar products. For Division III. the German figures are given in four subdivisions: (*d*) Aniline dyes; (*e*) anthracene dyes other than alizarine red; (*f*) alizarine red; (*g*) indigo.

At present the United States produces about 30 per cent. of its requirements of aniline dyes (Division III.), but almost entirely from materials of Division II. brought from Germany. The key to the situation lies in the latter division; and in this Germany controls the world's markets. This is due to the facts that, while the growth of this division was relatively slow, the field has become very much interwoven. Each of its hundred or more products is dependent upon, or made up of, one or more other products; no one of them being of use without still others. The industrial and commercial conditions or relations have grown with the technical development, so that the coal-tar dye industry is really a conglomerate of many separate parts acting and reacting upon each other, commercially and industrially. Not a single one of the 22 factories in Germany is wholly independent of the other factories there; whereas together they are independent of sources outside Germany, or can very readily be so should occasion arise.

Germany's supremacy in this field has been for more than thirty years a standing challenge to the chemists and capitalists of the whole world. Except Switzerland, no country has succeeded in selling Germany more coal-tar dyes than it buys from itself; but all of them without exception buy more of intermediate products—*i.e.*, Division II.—from Germany than they sell to it.

The seven European countries other than Germany noted for their chemists, and having a large and flourishing chemical industry, are Austria, Belgium, France, Great Britain, Italy, Russia, and Switzerland. Their indebtedness (in metric tons) to Germany, together with that of the United States, for 1913—the countries being arranged in order of their total indebtedness, which is distributed over the seven items—is as follows:—

| | Division II. | | | Division III. | | | | Net Total. |
|---|---|---|---|---|---|---|---|---|
| | (*a*) | (*b*) | (*c*) | (*d*) | (*e*) | (*f*) | (*g*) | |
| United States | 2428 | 638 | 965 | 13,855 | 2164 | 493 | 3461 | 24,004 |
| Great Britain | 340 | 333 | *34 | 10,793 | 1130 | 1493 | 1180 | 15,235 |
| Austria | 655 | 109 | 284 | 5,582 | *223 | 207 | 1361 | 7,975 |
| Italy | 650 | .. | 825 | 4,097 | 158 | .. | 662 | 6,392 |
| Russia | 602 | 1117 | 998 | 1,098 | 156 | 174 | 434 | 4,579 |
| Belgium | 120 | .. | 108 | 2,400 | 96 | .. | 313 | 3,037 |
| France | .. | 217 | 776 | 1,301 | 124 | 98 | 323 | 2,839 |
| Switzerland | 1217 | 272 | 1201 | *941 | .. | 259 | .. | 2,008 |
| Net totals | 6012 | 2686 | 5123 | 38,185 | 3605 | 2724 | 7734 | 66,069 |
| Number of countries Germany exported to | 11 | 6 | 11 | 32 | 12 | 9 | 21 | |

* Credit.

Summarized by Divisions II. and III., the results are:

| | II. | III. |
|---|---|---|
| United States | 4031 | 19,973 |
| Great Britain | 639 | 14,596 |
| Austria | 1048 | 6,927 |
| Italy | 1475 | 4,917 |
| Russia | 2717 | 1,862 |
| Belgium | 228 | 2,809 |
| France | 993 | 1,846 |
| Switzerland | 2690 | *682 |

* Credit.

According to the latest information available, the number of coal-tar dyestuff works in the world and their geographical distribution in eleven countries are as follows, in the order of their number of factories: Germany, 22; France, 11; Great Britain, 11; United States, 9; Austria-Hungary, 4; Switzerland, 4; Holland and Russia, 2 each; Belgium, Greece, and Italy, 1 each. In the course of the development of this business, 16 plants that made coal-tar dyes have abandoned the work—11 in Germany, and one each in Austria, Belgium, France, Great Britain, and Switzerland. Fourteen have been absorbed by others—six in Germany, four in Switzerland, two in France, and one each in Belgium and Holland. Where these seven countries together have failed so signally, it cannot be fairly urged as a fault of the chemists of the United States that they have not succeeded.

There is another side to this—viz., the investor's side. A self-contained and complete coal-tar dye industry in the United States would to-day call for preparedness to make about 700 different dyes. In the fiscal year 1913-14, the States imported indigo to the extent of £218,650; alizarine to the extent of £169,000, both of which are without tariff protection; £1,493,000 worth of aniline dyes with a duty of 30 per cent., and aniline oil with a duty of 10 per cent. This means that 700 different aniline dyes would average a gross annual income of about £2000 each. To introduce 700 different sets of operations, and perhaps about half as many different sets of apparatus at one time to produce, on an average, for each set of operations a gross of £7 per day, can hardly be regarded as an attractive proposition when the initial lump gross outlay would be not less than £1,000,000 actual cash. Each of these 700 products requires good manufacture from the start, because good qualities of each are already on the market. It is one thing to grow and develop such an industry or art and to maintain it against new comers; but it is quite a different thing to build it up afresh and in its entirety in the face of competition, and to hold it against those who developed the business, know all its ins and outs, have their experience, and plant bought, paid for, and written-off long ago.

The truth seems to be that the whole of this industry cannot be successfully transplanted, and attempts to transplant part only have not resulted in any self-contained and independent industry anywhere, but in a thing of which the real roots are still in German soil; and if it could be transplanted as a whole the net result would not be commensurate with the expense, effort, and risk connected with it. What portion or part, if any, and the equivalent of a complete and self-contained industry for all the domestic needs of the United States could ultimately

be transplanted, is a problem that has for many years had the serious attention of competent chemists and capitalists in America, without a definite or satisfactory answer thereto having been arrived at. Whether the present conditions will contribute to a solution thereof cannot be decided out of hand. The first impression certainly is that they will not so contribute.

## FIRE-PROOF BRICKS, RETORTS, &c.

### Exported from Germany and Austria-Hungary.

The Commercial Intelligence Branch of the Board of Trade have added to their long list of reports prepared to assist British trade, one on fire-proof bricks, retorts, crucibles, &c.

This report opens with the following particulars showing the value of bricks and other fire-proof products of clay and clayey substances exported from the countries concerned in the year named.

*Exports from Germany* (1912).

| | |
|---|---|
| Fire-proof bricks of all kinds (Chamotte, Dinas, bauxite, &c.)— | |
| Rectangular, each weighing (net) less than 5 kilos . . | £322,900 |
| Rectangular, each weighing (net) 5 kilos. or more; other than rectangular, without regard to weight . | 261,200 |
| Other fire-proof products of clay and clayey substances— | |
| Retorts . . . . . | 26,500 |
| Crucibles, muffles, and hollowed articles, other than retorts; slabs and other products, except bricks; crucibles of magnesia, cement, or soapstone . . | 33,100 |
| Total . . . . . | £643,700 |

*Exports from Austria-Hungary* (1913).

| | |
|---|---|
| Fire-proof bricks— | |
| (*a*) Dinas, magnesite, bauxite, and graphite bricks— | |
| Weighing up to 5 kilos. each . . . . . | £149,300 |
| Weighing over 5 kilos. each . . . . . | 74,500 |
| (*b*) Other— | |
| Weighing up to 10 kilos. each . . . . . | 15,800 |
| Weighing over 10 kilos. each . . . . . | 7,000 |
| Retorts, crucibles, muffles, and various articles for technical purposes, of fire-proof material (other than graphite) or common stoneware . . . . . | 1,700 |
| Total . . . . . | £248,300 |

The principal markets (mainly European) supplied by Germany, and the amount sent to each market, were: Russia, £156,100; France, £135,650; Belgium, £84,400; Italy, £52,000; Netherlands, £39,900; Switzerland, £28,600. The United Kingdom took from Germany £13,800 worth of these products in 1912—including £2700 worth of retorts. As to Austria, in 1913 the United Kingdom was one of her largest customers, taking such goods to the value of £16,520. The other principal purchasing countries and the amount of goods sent to each were: Russia, £42,710; France, £23,850; Italy, £17,050; Belgium, £7430.

Tables show that in 1912 Germany exported retorts to the following countries, to the value named: United Kingdom, £2700; Australia, £50; Norway, £50; Sweden, £350; Denmark, £3500; Netherlands, £6000; Belgium, £1700; France, £350; Switzerland, £2400; Portugal, £1300; Spain, £100; Italy, £700; Roumania, £350; Russia, £3900; Japan £1300; Dutch East Indies, £350; Brazil, £500. As to Austria, in 1913 the exports of retorts, crucibles, muffles, &c., only reached £60 in the case of two countries.

The exports of fire-proof bricks, &c., not being separately recorded in the trade returns of the United Kingdom, no comparison between the exports of the three countries is possible. It is known, however, that there is a fairly large production of such goods in this country; and on the basis of the foregoing figures, it would appear that the maximum amount of German and Austrian trade in fire-proof bricks, retorts, crucibles, &c., which might be diverted to British manufacturers under present circumstances is as follows:—

| | In the United Kingdom Market. | | In Colonial and Neutral Markets. |
|---|---|---|---|
| *German Trade* (1912). | | | |
| Fire-proof bricks of all kinds— | | | |
| Rectangular, each weighing less than 5 kilos. . . . . | £4,500 | .. | £286,950 |
| Rectangular, each weighing 5 kilos. or more; also bricks other than rectangular . . . . . | 4,400 | .. | 231,650 |
| Other fire-proof products of clay, &c.— | | | |
| Retorts . . . . . | 2,700 | .. | 22,900 |
| Crucibles, muffles, capsules, tubes, cylinders, &c. . . . . | 2,200 | .. | 24,850 |
| *Austro-Hungarian Trade* (1913). | | | |
| Fire-proof bricks— | | | |
| (*a*) Dinas, magnesite, bauxite, and graphite bricks— | | | |
| Weighing up to 5 kilos. each . . | 15,400 | .. | 67,350 |
| Weighing over 5 kilos. each . . | 1,100 | .. | 34,850 |
| (*b*) Other— | | | |
| Weighing up to 10 kilos. each . . | — | .. | 11,100 |
| Weighing over 10 kilos. each . . | — | .. | 3,550 |
| Retorts, crucibles, muffles capsules, nozzles, &c. . . . . | 20 | .. | 220 |
| | £30,320 | | £683,420 |

The report concludes with some useful information as to the trade in fire-proof bricks, &c., in certain markets abroad. For instance, a number of Canadian firms have been asking to be put into touch with British firms; but the Trade Commissioner for Canada suggests that the work being of a special kind the ordinary commercial agent will be found of small value. Firms should be chosen who already have a connection with contractors and similar concerns. There has been a steady decline in the proportion of British fire-clay manufactures, &c., imported into Australia; while imports from Germany were in 1911 of nearly twice the value of those of 1910. The value of fire-bricks, &c., imported into Russia in 1911 is placed at £157,797. Of this quantity, Germany supplied 81,018 tons, and Great Britain 28,027 tons. The trade is a continually increasing one. There is said to be a good opening for Scottish firms in Finland, as there are in that part no factories for the production of fire-brick; and in other parts of Russia there are excellent opportunities for increasing British trade.

## GERMAN INCANDESCENT MANTLES.

### Views of a "Ramie Expert."

The following letter, signed "Incandescent," appeared recently in the columns of a Manchester paper:

The bulk of the mantles used in this country are made in Germany; and there are very few manufacturers of gas-mantles in this country—the chief reason being that there are so very few Englishmen who have a knowledge of this trade throughout. The ramie yarn, from which the mantles are made, is produced from Chinagrass; and the first difficulty is to de-gum the raw Chinagrass, then to soften and comb it until a sliver is obtained of a quality that will spin into mantle yarn. Some of the English mantle manufacturers overcome this difficulty entirely by buying yarn from Germany ready prepared for mantles, while others actually buy the mantle stockings ready knit. These mantles are styled "Of British manufacture."

Another difficulty is the supply of thorium, with which the mantle stocking is impregnated. This is the first chemical process; and so far the Germans have had a monopoly of this trade. They fix the price; and buyers of thorium from the Berlin Syndicate have even to give an undertaking to sell their waste back to the Syndicate.

This state of things has arisen gradually, of course, and probably because the average British manufacturer likes to buy his materials ready for use. There are capable men here to-day who can make thorium; but the British users have always been content to buy German, and save themselves the trouble of making it.

I am a ramie expert, and manufacture ramie yarns from the raw Chinagrass. I have a friend who has been a chemical manager to a mantle manufacturer—who bought German yarn—for a good number of years, and can make his own thorium; and the two of us are quite independent of German products. We are open to commence a mantle manufactory, and can produce the best quality of mantles, equal to the best on the market, and can compete with the German article in price. But we have not the capital required. The plant would cost £4000 or £5000, in addition to which we should always require to keep about £2000 or £3000 for material and stock. We are looking for financial assistance.

## FIRE PRECAUTIONS FOR EMERGENCY HOSPITALS.

### "Warning" by the British Fire Prevention Committee.

It has been suggested to the above-named Committee, the Chairman of which is Mr. Edwin O. Sacks, F.R.S. Ed., by various authorities, that they should prepare some precautionary notice in the matter of fire dangers in hospitals and convalescent homes. They have accordingly compiled a number of useful rules for establishments of this kind which are doing emergency work in connection with war cases; and we reproduce those which most nearly concern our readers.

*Lighting Up.*—One person only should be deputed for this duty in each ward or department. For gas lighting—failing an electric lighter—a taper should preferably be used.

*Matches.*—These should be used carefully, especially in temporary buildings, and should not be thrown down when extinguished. Safety matches are preferable to any others. Do not leave matches in the reach of patients.

*Candles* are undesirable. They are easily bent out of shape, and may drop down and set things alight. If unavoidable, candlesticks should stand on plates. Candle night-lights should invariably stand on plates.

*Oil, Spirit, and Gas Cookers.*—These should stand, away from possible draughts, on stone or metal trays, preferably having an upright metal rim. They should be kept scrupulously clean. Oil and spirit cookers should be filled in a special room. Gas-cookers should be connected with metallic tubing as distinct from rubber piping.

*Gas-Lights.*—All gas-burners should be protected by globes or wire guards. Pendant gas-lights require stout fastenings and shields. Swinging brackets should not be used.

*Electric Lights.*—On no account should any paper or textile shade or cover touch, or be nearer than 2 inches to, any electric lamp bulb.

*Electric Wiring.*—On the slightest sign of heat or smell from a flexible wire, the wire should be unplugged or switched off. On no account should electric bed warmers be used.

*Portable Stoves and Pipe Stoves.*—These should stand on stone in metal trays projecting about 6 inches all round, with a turned-up rim about 6 inches high. The trays should be emptied and cleaned daily. On no account should wickless oil-stoves be used.

Copies of the "Warning" may be obtained free on application to the British Fire Prevention Committee, 8, Waterloo Place, S.W.

A brief failure which occurred lately in the electrical supply of Bermondsey was caused by a breakdown of a 500 kilowatt engine, resulting in the fracture of a cylinder and piston.

## NOTES FROM SCOTLAND.

**From Our Own Correspondents.**

*Saturday.*

The reality of war has been further brought home to Aberdonians by the putting into effect by the authorities of the order that all bright lights are to be extinguished. A month ago modified restrictions were brought into operation, especially in the vicinity of the harbour; but last week additional notification was received from the Government to reduce still further street and shop lighting in the city. As a result, the Magistrates made a tour of the town, and on their recommendation the police have instructed "lights out" in practically every thoroughfare which is visible from the sea. All bright lights have been extinguished, these including the powerful electric arc lamps on the standards in Union Street and elsewhere. Small incandescent lamps have been fixed in their places, and upon these are shades which throw all the light downwards. All bright and ornamental illuminations outside places of entertainment have been put out, and in the higher reaches of the city the streets are in almost total darkness. In private houses prominent lights are hidden behind suitable blinds; and, on the whole, the city presents a decidedly weird appearance. It is interesting to note that there are some 4600 gas-lights in the thoroughfares of Aberdeen, and this number has been reduced to 1888. In the case of the streets lighted by electricity, there are some 206 arc lamps, which have now been reduced to 105 lights. As a result of the reduction in lights, it would be expected that the employment of men in the Lighting Department would be affected: but so far there is no intention on the part of the department to curtail the staff of lamplighters, who will be given other work. It is stated that prior to the restrictions the candle power of the gas used for lighting the city streets was 331,780; whereas the present candle power is 73,080—a reduction of about 75 per cent. In the case of the electric lighting, the candle power was 311,750 prior to the restrictions, and it is now 6000—a reduction of more than 90 per cent. The total power was 643,530 candles, compared with 79,080 candles—a reduction of 564,450-candle power.

Following the example of other places, the public lighting of Dundee has been reduced as a matter of precaution. Acting under instructions from the military authorities, all the alternate lamps in the principal thoroughfares of the city were extinguished last Wednesday; and orders were given to all proprietors of shops and places of entertainment to modify the brilliant illumination in front of their premises. The carrying out of the order had a marked effect; the streets presenting a gloomy appearance which was very unfamiliar. With all her lights burning, Dundee sends into the sky a glare of sufficient brilliancy to act as a guide either to an airship or a naval squadron. Thus a reduction of the light is regarded as a prime necessity of defence. The arc lamps are the greatest offenders in the matter of glare, and it is intended shortly to replace them with the less intense incandescent filament lamp. Throughout the winter, therefore, the new and very much subdued system of lighting will be continued, and may even be still further modified.

All the public lights on the sea-front at Portobello, Joppa, and Musselburgh, at the mouth of the Firth of Forth, have been extinguished; but the lights of shops and houses have not been interfered with at present.

The general lighting of Edinburgh is to be decided upon after a visit has been made to a number of the streets by the Cleaning and Lighting Committee. The Gas Commissioners have agreed to deal with their employees who have joined the Colours and with their dependants in the same way as the Edinburgh Corporation have dealt with their employees in the matter of allowances. The Assessors have fixed the valuation of the undertaking for the current year at £79,312, against £110,775 last year. It was unanimously resolved at the Commissioners' meeting that only tradesmen should be engaged to do tradesmen's work; it being stated that handy men had been so employed. Mr. Masterton asserted that the previous instructions to employ tradesmen for tradesmen's work was being acted upon. The price of gas for private lighting has been retained at last year's rates. The arrangements that have been made with the military and town authorities for the protection during the war of the Commissioners' works and other property have been approved of by the latter.

At Falkirk, the price of gas supplied through ordinary meters is to be raised 4d., and that through prepayment meters by 2d., per 1000 cubic feet. This is partly accounted for by the estimated receipts for residuals being £1300 less than for last year.

In last week's "Notes," it was mentioned that the Glasgow Corporation had decided to submit to Parliament a scheme for augmenting the water supply of the city, subject to the advice of their Engineer (Mr. J. R. Sutherland) and their Consulting Engineer (Mr. E. P. Hill). These gentlemen have reported on the matter, and their report was considered by the Water Committee at meetings held last Tuesday and Wednesday. The result was a decision to recommend the Corporation to apply for a Provisional Order to sanction the utilization of the water of the River Turk, and its conveyance to Loch Katrine. At a special meeting held on Thursday, the recommendation was carried by 42 votes to 40. It is estimated that the scheme will yield an additional 15 million gallons per day to the city water supply. Whether it will produce sufficient to meet Glasgow's needs for some time to come depends entirely on the consumption in the city. But taking the increase at the rate of a million gallons per day, and remembering that at present there is still an additional supply of 15 million gallons to be developed from Loch Arklet, there would be sufficient to meet the demands for the next thirty years.

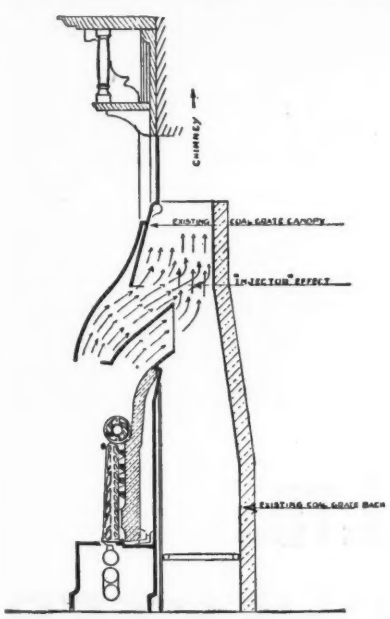
---

The Cardiff Finance Committee have decided to recommend the Council to apply to the Local Government Board for permission to borrow £14,000 for the water-works—namely, £10,000 for mains, £3000 for new services, and £1000 for meters.


# THE NEWEST STEP IN GAS FIRE PROGRESS.

**A further great forward "THERMO-X" Movement.**

**WRIGHT'S PATENT "INJECTOR VENTILATING" GAS-FIRE INVENTION.**




**Removes the last barrier to Gas-heating.**

**Ventilates Room fully equal to Coal Fire.**

Patent drawn up by leading Patent Counsel and pronounced maintainable against all infringements.

**JOHN WRIGHT & CO.,**
**Eureka Works,**
**BIRMINGHAM.**

## CURRENT SALES OF GAS PRODUCTS.

### The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Oct.* 5.

The tar products market is quite steady. For weeks past a considerable home trade in pitch has been done at 39s. to 40s. net per ton at makers' works. These prices are not obtainable, of course, for shipping lots. Some shipments of pitch are about to be made, boats having been chartered. Sixties carbolic acid and toluol are still in much request.

The position of sulphate of ammonia is very quiet, although shipments of considerable quantities continue to be made *ex* old contracts. The London makers generally prefer to wait for new business rather than accept dealers' present ideas of values.

### Tar Products in the Provinces.

*Oct.* 5.

There is little or no alteration in the markets for tar products. Ninety per cent. benzol is quiet, and some quantities are offering at reasonable prices. Solvent and heavy naphtha are steady, although there appears to be plenty offering. Crude carbolic seems a trifle steadier, though no higher prices are actually reported. Creosote remains steady.

Average values during the past week. Value of liquid products in one ton of tar, 15s. 9d. to 17s. 3d. Benzol, 90 per cent., naked, North, 9½d. to 10d.; 50-90 per cent., naked, 10d. to 10½d. Toluol, naked, North, 1s. 3d. to 1s. 3½d. Crude naphtha, in bulk, North, 4½d. to 5d. Solvent naphtha, naked, North, 10d. Heavy naphtha, naked, North, 11d. to 1s. Creosote, in bulk, North, 3¼d. to 3½d. Heavy oils, in bulk, 4d. to 4½d. Carbolic acid, casks included, 60 per cent., East and West Coast 2s. 1d. to 2s. 2d. Naphthalene, £5 to £10; salts, 50s. to 55s., bags included. Anthracene, "A" quality, 1⅞d. to 2d.; "B" nominally ⅞d.

[Our correspondent forwards a communication dealing with "Equity's" letter—see last week's issue, p. 725. It will appear next Tuesday.]

### Sulphate of Ammonia Prices in the Provinces.

LIVERPOOL, *Oct.* 3.

In consequence of a good inquiry from Java for early shipment, the tone of the market has been firmer since the middle of the week, and a small advance in prices has taken place. On the other hand, buyers in the United States require deliveries against contracts postponing on account of the financial stringency in the cotton area, and this fact has set free considerable supplies. The nearest values at the close are £10 7s. 6d. f.o.b. Hull, £10 8s. 9d. f.o.b. Liverpool, and £10 10s. per ton f.o.b. Leith. For forward delivery little actual business has transpired; but it is reported that first-hand transactions have taken place for November and December at a premium of 1s. 3d. to 2s. 6d. per ton on prompt prices.

### Nitrate of Soda.

The market for this article is weaker, and spot quotations have been reduced to 10s. per cwt. for ordinary quality, and 10s. 6d. for refined.

### Sulphate of Ammonia.

From another source it is stated that there is very little business doing in this article, and so makers appear to be inclined to accept the prices being mentioned at the present moment. Outside London makes are quoted at £9 7s. 6d. to £9 10s.; Hull, £10 5s. to £10 6s. 3d.; Liverpool, £10 6s. 3d. to £10 7s. 6d.; Leith, £10 7s. 6d.; Middlesbrough, £10 6s. 3d.

## COAL TRADE REPORT.

### Northern Coal Trade.

There has been a further slight improvement in the demand for certain classes of coal; but the lack of exports to the Continent is still felt. In the steam coal trade, the demand is fair from Norway and Denmark. The price of best Northumbrian steams varies from about 13s. to 13s. 3d. per ton f.o.b.; second-class steams are near 11s. 3d. per ton; while steam smalls are rather scarcer, and are quoted from 8s. to 9s. 3d. per ton, according to the quality—which is relatively high. At the gas-coal collieries, work is now a little fuller. The number of men at work at many of the collieries is brought below the usual number by enlistments; so that it is possible that the output may be comparatively limited as the winter requirements show themselves. Best Durham gas coals are steady at 12s. 6d. per ton f.o.b.; second-class gas coals are about 11s. per ton; and "Wear Specials" are firm at 12s. 6d. to 12s. 10d. per ton f.o.b. There is a stronger demand for gas coals for some of the Italian ports. The export to the Mediterranean generally is fairly good in all the circumstances, and the high freights and cost of war risks especially. There is little doing in contracts for gas coal at the present time. Coke is fairly steady. Gas coke is plentiful, and its price is a little irregular. Good gas coke may be quoted as about 11s. 9d. to 12s. 6d. per ton f.o.b., but values are affected by the amount of the stocks that may be held.

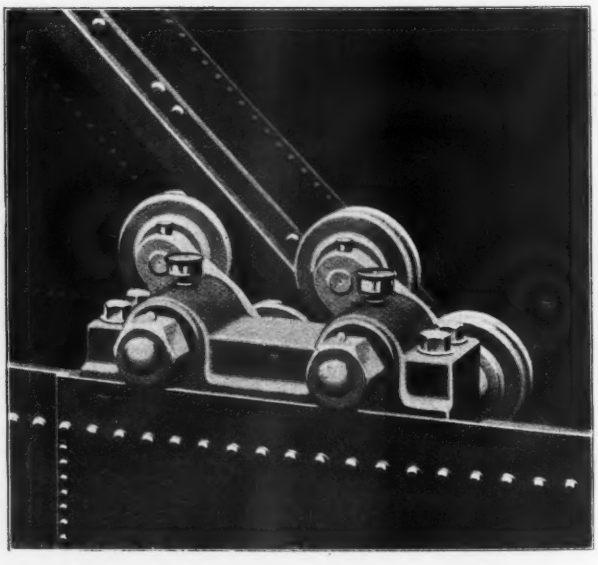
The Heysham District Council are becoming increasingly annoyed with the Morecambe Corporation, on account of the alleged poor quality of gas supplied by Morecambe for lighting purposes at Heysham. A similar complaint is, it is said, heard among the population of Morecambe in regard to their own lighting. The Heysham Council have been in communication with the Morecambe authority, but having so far had neither a reply nor an improvement in the gas, a strongly-worded resolution on the subject was adopted last week.


# "BEARSCOT" SPECIALITIES.

"THE NEW BEARSCOT TWIN GUIDE ROLLERS"

marks the latest development in

Spirally-Guided GASHOLDERS.



# R. & J. DEMPSTER, LTD., MANCHESTER.

Tel. Address:
"Scrubber, Manchester."

## Street Repairs in Exeter.

At a meeting of the Exeter City Council last Tuesday, Mr. Challice asked whether the Surveyor exercised his fullest powers over the Gas Company and others when making-up footpaths after carrying out work on mains, &c. In one recent instance, repairs had been carried out in a very parsimonious way. If all the powers existing were exercised, they should be increased, so that repairs might be made on a more liberal scale. He also inquired whether it was not possible, where the Gas Company broke-up a bit of bad footpath, to induce them to substitute a good path, partly at the cost of the Corporation. The Surveyor replied that he had no authority to make any such arrangement. All the present powers were enforced. He had not inspected the path to which attention was called. Mr. Challice moved that the question be referred to the Streets Committee; and Mr. Clapp, in seconding, asked the Committee to consider whether it would not be possible to construct one main conduit in Exeter to take the gas and water pipes and the electric light and telephone wires. The resolution was agreed to; the Committee being requested to report upon the whole question of subterranean communications.

## A Novel Form of "Pilot."

People who use pilot-jets with their incandescent gas-burners have just cause of complaint against them. They are, as ordinarily made, at once a convenience and an inconvenience. Householders do not want to be troubled by them; but they have, without occasional attention, an unhappy knack of getting corroded, and eventually the jets get down to such limits that the very act of turning on the gas will cause their extinction before the gas at the main burner is ignited. Something is wanted that is incorrodible, and something that is easy to apply. Mr. R. S. Godson some time ago invented and patented a little cup for taking the place of the ordinary cap of the pilot-jet tube; and he has sent us some samples. The cup is filled with asbestos, so that no corrosion takes place, nor is deposition encouraged as with the ordinary tip. Using the cup, the pilot-jet adjusting screw is fully opened; and regulation is effected by simply pressing the asbestos down to the necessary degree. The asbestos is always maintained at a glow, which, it is stated, never fails to light up the main flame, although the estimated consumption of gas is only about 1 cubic foot per twenty-four hours. There is no smell, and the asbestos packing of the tiny cup is said to be as serviceable at the end of twelve months as on the day of its first use. A point that occurs to us is that in these days inverted gas-burners are largely the fashion. Where "pilots" are used, the Godson cup would be inverted, and we should be afraid of the incandescent asbestos packing being dislodged by vibration.

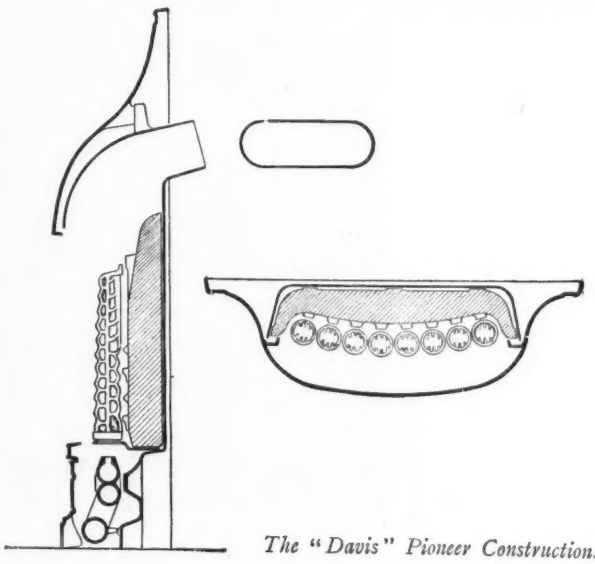
Messrs. Trier Bros., Limited, point out that "Stauffer's Lubricant," with which their name has been connected for the past thirty years, is made solely by them in England.

## The Proper Use of the Gas-Cooker.

Since the war began, there has been much written and said about the necessity for household economy. Household economy extends over the cooking of food and labour-saving in the kitchen. Gas is wasted through the improper use of the gas-cooker; food is wasted through the same cause; unnecessary labour is created through the cause that wastes the food, and so are objectionable smells. The sources of uneconomy and the disagreeable smell can be avoided by the adoption of proper methods, and attention to detail. Mr. R. Gamble Marks, of Southport, who has devoted himself largely to instructional work in connection with the proper use of the gas-oven, and has devised means for so doing, tells us that he has, in interviews with users of ovens in the districts of some important gas undertakings, been surprised to find how little has been done to personally instruct householders (which is work in which he has been considerably engaged) in the matter of the details that make all the difference in domestic economy and satisfaction, and therefore how much there is yet to be done. Mr. Marks' system, as is known, embraces the use of what he calls a heat distributor in the oven, and the Bakewell roaster, which is an enclosed tin, with adjustable ventilating-slide. These adjuncts to the gas-oven, testimonials show, are largely favoured by those gas engineers whose gas consumers have tried them. The reports of the users upon them are invariably good. The consumers find that the employment of the roaster in the oven helps to retain the nutritious juices of the meat, and smell is avoided and labour is lessened by the prevention of the splashings of grease on the sides of the oven, and its carbonization there. The avoidance of this must be (apart from the satisfaction engendered by the result) of direct advantage to gas undertakings with cookers out on hire, as there cannot fail to be, through the greater cleanliness, a saving in the cost of maintenance and renovation. The period when renovation is necessary must be extended. Among some literature sent to us by Mr. Marks, there is a folder that he has prepared for distribution among gas consumers, and copies of this can be purchased in quantities. It is instructional, and shows how to use the gas-cooker in order to get from it the maximum result. There is a cooking time-table on one page, and some recipes on another. The folder is so cheap (purchased in quantities) that it can be distributed broadcast without incurring much expense. Some gas engineers who have distributed copies, speak of the interest it has aroused in rational cooking methods.

**The Increase in Price by the South Suburban Gas Company.**—Last week, we reported the increase of 2d. per 1000 cubic feet made by the South Suburban Gas Company, but did not mention that the advance does not apply to the public lighting. The circular to the consumers announcing the rise states: "It was hoped that a period of high-priced coal would have been tided-over without advancing the price of gas; but, owing to circumstances arising out of the war, this has now become impossible. The Directors need hardly say that a reduction of price will be made at the earliest possible date."


# The Original Hygienic Gas Fire.



*The "Davis" Pioneer Construction.*

Section of the Original Hygienic Gas Fire introduced by us in 1911. It has driven every unhygienic gas fire from the market, and has been adopted by all makers in 1914.

**The Davis Gas Stove Company, Ltd.,**
**Originators of Hygienic Gas Fires, 60, Oxford Street, London, W.**

## Gas-Stoves at West Bromwich.

An important scheme for the hiring of gas-stoves at reasonable rates has just been inaugurated by the West Bromwich Gas Department, who are working in conjunction with a strong gas-stove makers' combine. The Gas Manager (Mr. W. H. Johns) is doing all he possibly can, both by advertisement and personal influence through a specially appointed agent, to ensure the success of the scheme. All the latest patterns in gas-stoves are on view at the works and the Corporation show-rooms in High Street; and these are let out on hire at a nominal rental of 1s. per quarter—the Corporation fixing them with anything up to 20 feet of piping free. Great success has already attended the enterprise; and it is stated that over 400 orders for gas-stoves have been received within the last week or so. The demand that has so far been made augurs well for the complete success of the scheme.

## Gas-Lighted Railway Trains.

In the course of the general report to the Board of Trade upon Railway Accidents in the United Kingdom during 1913, Mr. W. F. Marwood, Assistant-Secretary in the Railway Department, says: "In the Inspecting Officer's report on the collision at Aisgill, attention was again called to the danger of gas as an illuminant for railway carriages; and the Board wrote to the principal railway companies repeating their recommendation that electricity should be substituted on main line and express trains. Some of the larger companies have adopted this policy; but the proportion of coaching-stock of the sixteen chief companies lit by electricity is still not much more than one-fifth. Most companies that still use gas as an illuminant have adopted the Board's recommendation in favour of the use of automatic shut-off valves in connection with gas-cylinders; and it may be mentioned that in the case of the collision at St. James's Station, Liverpool, on the Cheshire Lines, in which one of the high-pressure pipes was broken near the cylinder, the escape of the gas was prevented by the safety-valves." If comment were made upon these remarks, it would simply follow on the lines of that which appeared in the "JOURNAL" for Dec. 2, 1913 [p. 727], when dealing with the report on the Aisgill disaster.

**Gas-Fitting Classes at West Bromwich.**—The Committee of the Municipal Science and Technical School at West Bromwich having been approached by the local Gas Manager (Mr. W. H. Johns, late of Great Malvern) decided to arrange for a class in gas-fitting to be held. The teacher appointed is Mr. W. Batt, who is under the Corporation of Birmingham. A preliminary meeting of the class was held last Thursday week; and already there are nearly as many attending as one teacher can manage alone. Mr. Johns has arranged to lend various specimens of burners, cookers, lighting, and other appliances, so there will be every opportunity for those who attend to become thoroughly acquainted with their subject.

**Cardiff Water Supply.**—The City Treasurer (Mr. John Allcock), in his annual report on the Cardiff water undertaking, states that the net income on revenue account for the past financial year was £79,344, and the general expenditure £30,866, leaving £48,478 to be carried forward to the net revenue account, which was thus brought up to £62,890. The loan charges, &c., amounted to £59,647.

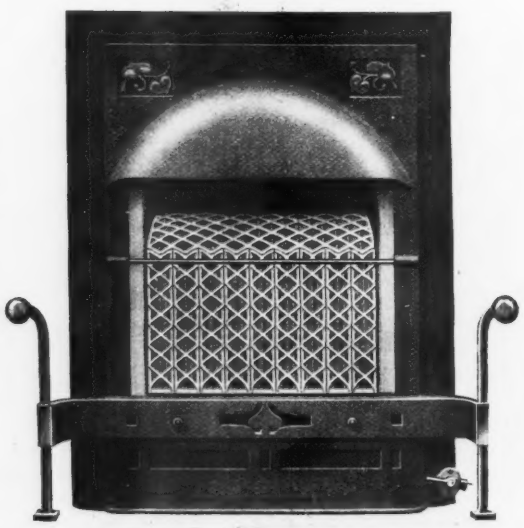
**The New Gas Show-Rooms at Hanley.**—In connection with the photograph and description given in the last issue [p. 731] of the new show-rooms in Broad Street, Hanley, which were opened by the British Gaslight Company on the 28th ult., it is interesting to note that the visitors on the first day numbered nearly a thousand. The show-rooms promise to become a valuable "business-getter."

**Leamington Priors Gas Company.**—The half-yearly meeting of this Company last Tuesday was under the presidency of Alderman T. W. Thursfield, M.D. In the course of his remarks, the Chairman stated that the Company had had a fairly successful half year, though they were heavy losers on their coke sales. Their ammonia was very difficult to sell, owing to the fact that about 75 per cent. of it went abroad for the purpose of growing beet for the manufacture of sugar. With regard to tar, the light products were in demand, as the large exports of carbolic and medical salts from Germany had ceased; but with regard to pitch, the bulk of which left England for the purpose of making briquettes in France and Belgium, there was at present no market. It was to be hoped that Germany would be driven from France before the winter set in; otherwise the French and Belgians would have difficulty in getting power for their trains or warmth for their homes. Dividends of £1 per share on the "A" shares, 14s. on the "B" shares, and 9s. 10d. on the "C" shares were declared.

**A Call for Efficiency and Zeal by Co-Partners.**—As already announced in the "JOURNAL," the South Metropolitan Gas Company have been compelled, for reasons which have been explained, to raise the price of gas. This will result in a reduction of the shareholders' dividend and the co-partners' bonus. Referring to the matter, the Editor of the Company's "Co-Partnership Journal" makes the following remarks in the current issue: "It is not thought advisable, especially with the present industrial outlook, to further postpone the inevitable; and so we must perforce be content. But contentment is not quite what is required of us. If every co-partner would do his very best to advance the interests of the Company, we should soon see a prospect of a reduction. The call is not for 'sweating' or 'speeding-up;' it is for intelligent interest in work, avoidance of waste in time and material, courteous and tactful treatment of the public, and a realization by every co-partner that it is his own business that he is asked to push. Can we not—those of us who are unable to be in the armed forces of our country—prove that we possess the virtues of loyalty, comradeship, and determination to make the common cause a success, in as great a degree as the brave soldiers of the King?" The words are applicable to the co partners in other companies who have been forced to increase their price.


# The SILENT HEAT of the SUN.

"OLD SOL" (Silent Heat). AND THE "NEW SOLA" (Silent Heat).



## The WILSON NEW "SOLA"

The "REALLY SILENT and REALLY HOT" GAS FIRE.

Illustrated Pamphlet of "SOLA" Series post free from Manufacturers:

**Wilson & Mathiesons, Ltd.,** Carlton Works, ARMLEY, LEEDS. London Office: 76, Queen St., Cheapside, E.C.

## German Incandescent Gas-Light (Auer) Company.

According to the "Berliner Tageblatt" of the 13th ult., as quoted by the "Ironmonger" last Saturday, the German Incandescent Gas-Light (Auer) Company of Berlin reports that in spite of the war the works are still fairly well occupied. It has, of course, been necessary to reduce the output considerably, as at present the Company can only count upon home business. Sales to neutral as well as to enemy countries have been completely interrupted; but the Company hope that before long the conditions of railway carriage will be so improved that deliveries to neutral countries may be resumed. The Company have received orders for the Army, but these are mostly for old products—*i.e.*, electric and incandescent lamps—which are required for hospitals, depôts, and other military institutions. Contrary to the practice of many other factories whose normal activities have been diminished by the war, the Auer Company have not taken up the manufacture of new products for military purposes. In estimating the financial position of the Company, it must be remembered that they maintain large branch establishments in enemy countries which have brought in rich profits, especially during the last few years. The principal branches of this kind are the Osram Lamp-Works in London and La Lampe Osram in France.

**High-Pressure Gas at West Bromwich.**—High-pressure gas is increasing in popularity in the West Bromwich district, and the Gas Committee have now decided to extend the mains into an entirely new area for a distance of 130 yards.

**The Only Lady Gas Manager.**—Miss Richmond, of Magherafelt (Co. Londonderry), who claimed the distinction of being the only lady gas manager in the world, has retired from the position on her marriage. Her father was a gas manager, three of her brothers filled positions as gas managers, and she has held the Magherafelt post for seven years and won much popularity in this unique position by her capability and enterprise.

**Cirencester Gas Company, Limited.**—The annual meeting of this Company was held last Wednesday, when it was reported that the profit for the past year was £2544—a reduction as compared with the previous year, which was one of "exceptional prosperity," the Board remark; but "this arises through the extra cost of coal and material and the increase in rates, &c." In addition there was a loss of £200 through the price of gas having been reduced 2d. per 1000 cubic feet as from Dec. 31. Interest on the debentures and the usual interim dividend have been paid, and the Directors now recommended a further dividend at the rate of £12, £6, and £8 8s. per cent. on the several classes of shares respectively—making £11, £5 10s., and £7 14s. per cent. for the year. They did not propose to recommend the paying of any further sum to the contingency fund, but to carry forward the whole balance in hand.

## APPLICATIONS FOR LETTERS PATENT.

19,993.—Gibbons Bros., Ltd., Masters, R., and Marle, M. van, "Coke-discharging machine." Sept. 21.

20,014.—Johnson, P. R., "Gas-pump." Sept. 21.

20,016.—Koppers, H., "Manufacture of gas and ammonia by gas-producers." Sept. 21.

20,036.—Atkinson, D., "Waste-heat utilizer for gas-cookers." Sept. 22.

20,093.—Hodson, J. L., "Fluid meters." Sept. 23.

20,109.—Wilkinson, G., "Automatic control of temperature." Sept. 24.

20,165.—Jones, G. T., "Gas and other tubes." Sept. 25.

20,199.—Carpenter, H. A., Warner, A. W., and the Riter-Conley Manufacturing Company, "Closure locking means for gas-retorts." Sept. 25.

20,200.—Carpenter, H. A., Warner, A. W., and the Riter-Conley Manufacturing Company, "Means for controlling the operation of gas-retorts." Sept. 25.

20,206.—Tilley, F. C., "Vapour burners." Sept. 25.

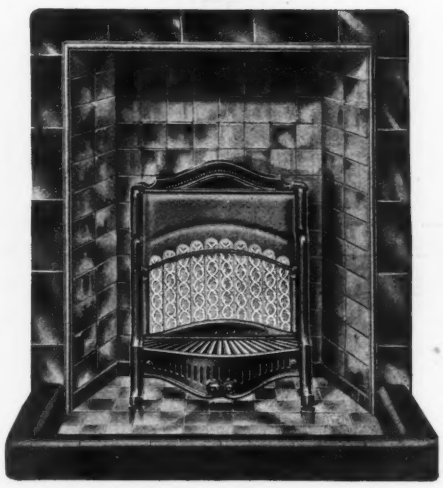
Complaint has been made in the Bexhill Town Council that trees are being destroyed "through being poisoned by gas;" and it was decided to approach the Local Government Board on the matter—the Gas Company, it is stated, having "refused to adequately compensate the Council."

While a local photographer named Airton was engaged in manipulating an acetylene gas lighting apparatus at the Gargrave Liberal Club, a loud report was heard, and members who ran to his assistance found him lying insensible and bleeding profusely from cuts on the head. He was removed to his home, where he died without regaining consciousness.

Attention is drawn in the season 1914-15 fire booklet of the Parkinson Stove Company to several new pattern fires the firm are introducing; and some remarks are made upon the special features of the Parkinson productions. In addition to the many illustrations and descriptions of fires, radiators are also dealt with in the booklet, which is prepared on the excellent lines laid down for previous similar issues by the firm.

The first edition of an elaborate and exceedingly interesting book entitled the "Magnet of Commerce" has been issued by the Great Central Railway Company, who feel that the developments which are constantly taking place in the important coalfields of Yorkshire, Lancashire, Nottinghamshire, Derbyshire, and elsewhere, and the opening of the new dock at Immingham call for a publication which will periodically give useful information to the coal owner and colliery manager, as well as to the exporter and the numerous business firms and trades associated with coal. Successful as the present edition is, still better things are promised for future ones. Much trouble must have been taken in compiling the statistics given.


# PARKINSON'S NEW PRODUCTIONS



## THE "DOMINION."

A Handsome Fire quite distinct from anything yet attempted in design and specially adapted for use in a tiled recess or open hearth.

The Copper Reflector considerably enhances the artistic effect.

The new pattern Fuel gives a greater heating efficiency than any other fuel on the market.

**PRICES.**

**10 in. Fire 28s. 6d. 14 in. Fire 37s. 6d.**

(Best Art Finish).

**THE PARKINSON STOVE CO., LTD.**
**BIRMINGHAM & LONDON.**

**No Increase in the Price of Windsor Gas** —At the half-yearly general meeting of the Windsor Royal Gaslight Company, the Chairman (Mr. W. B. Holderness, J.P.), in presenting a highly successful statement of accounts for the past half year, stated that some of the London companies had been compelled to announce an increase in the price of their gas, owing to the very high cost of coals and the low price of all residuals. Windsor residents would be glad to hear that, so far as could now be seen, no increase would be necessary.

**Rochdale Gas Consumers Forewarned.**—At the last meeting of the Rochdale Town Council, Mr. Walker, the Chairman of the Gas Committee, reminded the members that though coal contracts had been accepted at 1s. per ton less than last year, the benefit from this would be more than balanced by the reduction in the price of coke, and would really not be felt for more than half the current year. The financial results of the current year would not be any better, but probably much worse, than last. He asked the members of the Council to remember this, and so prevent disappointment when the result of the year's working was presented.

---

The cost of the joint report (recently noticed in our "Electricity Supply Memoranda") on the Southampton electricity undertaking, by Sir J. Snell and Mr. Edmonds, was £593, including fees, expenses, and printing. The Parliamentary Committee are considering the report.

In connection with the death of a Wolverhampton man, who was found sitting with his head resting on the top of a stove, a tap of which was turned on, evidence was given at the inquest to the effect that deceased had removed the bars from the hot-plate of the stove, in order to facilitate the passage of gas to his mouth.

The local Council have been approached by the promoters of the Midhurst Electric Lighting Order with regard to the formation of a Company to carry the Order into effect, and also to secure permission to erect overhead wires. It is pointed out that the capital cost of underground wires would render the scheme prohibitive, and that the financial success of it depends upon using overhead wires practically throughout the district, with the exception of certain thoroughfares in Midhurst. The desired permission has been given.

At the last meeting of the Kingskerswell Parochial Committee the lighting question was considered. Mr. Searley moved that the lighting be by gas. Mr. French thought it would mean a 9d. rate; but the Chairman (Mr. W. H. Mortimer) pointed out that the capital expenditure would be extended over three or four rates. It would cost £25 a year. Dr. Hutfield said if they were going to spend any money at all they should spend it on gas. The motion was carried by seven votes to two. A Committee was appointed to inspect the present oil-lamp standards and report. It is understood that Kingskerswell will be lighted by the Torquay Gas Company.

## GAS COMPANIES IN THE STOCK EXCHANGE.

During the past week some progress has been made in clearing the way to a reopening of the Stock Exchange by the adoption of some measures which are directed to that end. On Friday, the Committee promulgated a new rule (temporary in its operative duration) whereby the wholesale hammering of members, which it was dreaded would be the inevitable attendant of a reopening, will be prevented. In brief, the new rule enacts that if a member cannot meet his engagements he shall not be at liberty to declare himself a defaulter, but the Committee will (if they think fit) place his affairs in liquidation, and the member will be suspended from dealing pending the result. This step, bold as it may seem, cannot have been resolved upon without the most careful prior consideration having convinced the Committee of its desirability; but, naturally, it is being much discussed, and finds some opponents in those whose interests it will not advance. On the same day the Committee also ordered a further postponement of settlement dates to Nov. 18 and Dec. 1. In Wednesday's "London Gazette" a further extension of the Moratorium by Proclamation was notified. Business in the open-air market during the week has been very quiet. The tendency at first was firm, and Consols were called 68 9/16. But in mid-week, owing to scant attendance and to some impatience at the prolonged indecision of the great struggle on the Oise and Aisne, prices were somewhat easier, and Consols were quoted 1/16 down. No further change in the best qualities of securities took place later on. The state of the Money Market underwent no alteration; short loan rates being very easy and discount remaining steady.

### OFFICIAL QUOTATIONS AT THE CLOSE OF THE STOCK EXCHANGE ON JULY 30.

Bank Rate (fixed Aug. 8), 5 per cent. Last year, 4½ per cent. Consols, —. Previous week, —.

| Issue. | Share. | When ex-Dividend. | Dividend or Dividend & Bonus. | NAME. | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. |
|---|---|---|---|---|---|---|---|
| £ | | | p.c. | | | | £ s. d. |
| 1,551,868 | Stk. | April 8 | 2½ | Alliance & Dublin Ord. | 59–64 | .. | 3 18 2 |
| 374,000 | ,, | July 10 | 4 | Do. 4 p.c. Deb. | 76–79 | .. | 5 1 3 |
| 280,000 | 5 | April 29 | 7½ | Bombay, Ltd. | 5⅛–6⅜ | .. | 5 17 8 |
| 50,000 | 10 | Feb. 26 | 16 | Bourne- mouth Gas & Water } 10 p.c. | 29–30 | .. | 5 6 8 |
| 373,480 | 10 | ,, | 7 | B 7 p.c. | 15–15½ | .. | 4 10 4 |
| 95,000 | 10 | ,, | 6 | Pref. 6 p.c. | 13½–14 | .. | 4 5 9 |
| 380,000 | Stk. | Feb. 26 | 14 | Brentford Consolidated | 261–266 | .. | 5 5 3 |
| 330,000 | ,, | ,, | 11 | Do. New | 204–209 | .. | 5 5 3 |
| 50,000 | ,, | ,, | 5 | Do. 5 p.c. Pref. | 109–111 | .. | 4 10 1 |
| 206,250 | ,, | June 11 | 4 | Do. 4 p.c. Deb. | 91–93 | .. | 4 6 0 |
| 217,380 | Stk. | Feb. 26 | 11 | Brighton & Hove Orig. | 208–213 | .. | 5 3 4 |
| 244,200 | ,, | ,, | 8 | Do. A Ord. Stk. | 154–159 | .. | 5 0 8 |
| 530,000 | 20 | Mar. 26 | 12½ | British | 44–45 | .. | 5 11 1 |
| 120,000 | Stk. | June 26 | 4 | Do. 4 p.c. Deb. Stk. | 88–90 | .. | 4 8 11 |
| 245,771 | Stk. | June 26 | 4 | Buenos Ayres 4 p.c. Deb. | 85–87 | .. | 4 12 0 |
| 100,000 | 10 | — | — | Cape Town & Dis., Ltd. | 1⅛–2⅛ | .. | — |
| 100,000 | 10 | — | — | Do. 4½ p.c. Pref. | 4–6 | .. | — |
| 100,000 | Stk. | June 26 | 4½ | Do. 4½ p.c. Deb. Stk. | 70–75 | .. | 6 0 0 |
| 157,150 | Stk. | Feb. 26 | 5 | Chester 5 p.c. Ord. | 108–110 | .. | 4 10 11 |
| 1,513,280 | Stk. | Feb. 12 | 5/9/4 | Commercial 4 p.c. Stk. | 106–108 | .. | 5 1 2 |
| 560,000 | ,, | ,, | 5⅛ | Do. 3⅛ p.c. do. | 103–105 | .. | 5 1 6 |
| 475,000 | ,, | June 11 | 3 | Do. 3 p.c. Deb. Stk. | 69⅛–71⅛ | .. | 4 8 11 |
| 800 000 | Stk. | ,, | 4 | Continental Union, Ltd. | 76–79 | .. | 5 1 3 |
| 200 000 | ,, | ,, | 7 | Do. 7 p.c. Pref. | 115–118 | .. | 5 18 8 |
| 492,270 | Stk. | — | 6 | Derby Con. Stk. | 128–125 | .. | 4 16 0 |
| 55,000 | ,, | — | 4 | Do. Deb. Stk. | 102–104 | .. | 3 16 11 |
| 1,002,180 | 10 | July 29 | 10 | European, Ltd. | 17⅞–18* | .. | 5 11 1 |
| 16,362,910 | Stk. | Feb. 12 | 4/17/4 | Gas 4 p.c. Ord. | 98–102 | .. | 4 15 6 |
| 2,600,000 | ,, | ,, | 3½ | Light 3½ p.c. max. | 76–79 | .. | 4 8 7 |
| 4,062,235 | ,, | ,, | 4 | and 4 p.c. Con. Pref. | 96–99 | .. | 4 0 10 |
| 4,674,850 | ,, | June 11 | 3 | Coke 3 p.c. Con. Deb. | 72½–74½ | .. | 4 0 6 |
| 258,740 | Stk. | Mar. 12 | 5 | Hastings & St. L. 3½ p.c. | 87–89 | .. | 5 12 4 |
| 70,000 | 10 | April 29 | 11 | Hongkong & China, Ltd. | 16½–16⅝ | .. | 6 11 4 |
| 131,000 | Stk. | Mar. 12 | 7¾† | Ilford A and C | 151–154 | .. | 5 2 4 |
| 65,780 | ,, | ,, | 6⅜† | Do. B | 115–118 | .. | 5 8 0 |
| 65,500 | ,, | June 26 | 4 | Do. 4 p.c. Deb. | 92–94 | .. | 4 5 1 |
| 4,940,000 | Stk. | May 14 | 9 | Imperial Continental | 150–160 | .. | 5 12 6 |
| 1,235,000 | Stk. | Feb. 12 | 3½ | Do. 3½ p.c. Deb. Red. | 84–86 | .. | 4 1 5 |
| 200,242 | Stk. | Mar. 12 | 6½ | Lea Bridge Ord. 5 p.c. | 119–121 | .. | 5 7 5 |
| 561,000 | Stk. | Feb. 26 | 10 | Liverpool United A | 211–213 | .. | 4 13 11 |
| 718,100 | ,, | ,, | 7 | Do. B | 146–148 | .. | 4 14 7 |
| 306,083 | ,, | June 26 | 4 | Do. Deb. Stk. | 97–99 | .. | 4 0 10 |
| £ | | | p.c. | | | | £ s. d. |
| 75,000 | 5 | June 11 | 6 | Malta & Mediterranean | 4⅛–4⅜ | .. | 6 9 9 |
| 250,000 | 100 | April 1 | 4½ | Met. of Melbourne } 4½ p.c. Deb. | 99–101 | .. | 4 9 1 |
| 541,920 | 20 | May 28 | 4 | Monte Video, Ltd. | 11½–12 | .. | 6 13 4 |
| 1,775,892 | Stk. | July 29 | 4½ | Newc'tle&G'tesh'd Con. | 93½–99½ | .. | 4 10 6 |
| 529,705 | Stk. | June 26 | 3½ | Do. 3½ p.c. Deb. | 82–83 | .. | 4 4 10 |
| 55,940 | 10 | Feb. 26 | 7,14,0 | North Middlesex 7 p.c. | 14–15 | .. | 5 2 8 |
| 300,000 | Stk. | May 14 | 8 | Oriental, Ltd. | 117–122 | .. | 6 11 2 |
| 60,000 | 5 | Mar. 26 | 10 | Ottoman, Ltd. | 7⅛–7⅜ | .. | 6 9 0 |
| 60,000 | 50 | Feb. 26 | 13 | Portsea, Island B | 128–131 | .. | 4 19 3 |
| 100,000 | 50 | ,, | 12 | Do. C | 118–121 | .. | 4 19 2 |
| 249,980 | 5 | April 29 | 8 | Primitiva Ord. | 5½–6 | .. | 6 13 4 |
| 499,960 | 5 | June 26 | 5 | ,, 5 p.c. Pref. | 4¾–5 | .. | 5 0 0 |
| 521,600 | 100 | June 2 | 4 | ,, 4 p.c. Deb. | 91–93 | .. | 4 6 0 |
| 346,198 | Stk. | June 26 | 4 | River Plate 4 p.c. Deb. | 85–87 | .. | 4 12 0 |
| 150,000 | 10 | May 14 | 6 | San Paulo { 6 p.c. Pref. | 10½–11 | .. | 5 9 1 |
| 125,000 | 50 | July 1 | 5 | 5 p.c. Deb. | 47–49 | .. | 5 2 0 |
| 135,000 | Stk. | Mar. 12 | 10 | Sheffield A | 238–224 | .. | 4 9 3 |
| 209,984 | ,, | ,, | 10 | Do. B | 222–224 | .. | 4 9 3 |
| 523,500 | ,, | ,, | 10 | Do. C | 220–222 | .. | 4 10 1 |
| 90,000 | 10 | May 28 | 9 | South African | 10⅛–11⅛ | .. | 7 16 6 |
| 6,429,895 | Stk. | Feb. 12 | 5/9/4 | South Met., 4 p.c. Ord. | 111–113 | .. | 4 16 8 |
| 1,895,445 | ,, | July 10 | 3 | Do. 3 p.c. Deb. | 72½–74½ | .. | 4 0 6 |
| 209,820 | Stk. | Feb. 26 | 8½ | South Shields Con. Stk. | 157–159 | .. | 5 6 11 |
| 952,795 | Stk. | Feb. 26 | 6 | S'th Suburb'n Ord. 5 p.c. | 114–116 | .. | 5 3 5 |
| 60,000 | ,, | ,, | 5 | Do. 5 p.c. Pref. | 110–112 | .. | 4 9 3 |
| 137,058 | ,, | June 26 | 5 | Do. 5 p.c. Deb. Stk. | 116–118 | .. | 4 4 9 |
| 629,740 | Stk. | May 14 | 5 | Southampton Ord. | 99–102 | .. | 4 18 0 |
| 120,000 | Stk. | Feb. 12 | 7½† | Tottenham { A 5 p.c. | 135–138 | .. | 5 2 8 |
| 742,275 | ,, | ,, | 6† | District { B 3½ p.c. | 115–117 | .. | 5 2 7 |
| 181,255 | ,, | June 26 | 4 | 4 p.c. Deb. | 87–89 | .. | 4 9 11 |
| 182,380 | 10 | Dec. 30 | 5 | Tuscan, Ltd. | 5–6 | .. | 8 6 8 |
| 149,900 | 10 | July 1 | 5 | Do. 5 p.c. Deb. Red. | 93–95 | .. | 5 5 3 |
| 236,476 | Stk. | Mar. 12 | 5 | Tynemouth, 5 p.c. max. | 108½–109½ | .. | 4 11 4 |
| | | | | Wandsworth, Wimbledon, and Epsom— | | | |
| 30,000 | Stk. | Feb. 26 | 8⅜ | Wandsworth A 5 p.c. | 151–156 | .. | 5 7 4 |
| 255,636 | ,, | ,, | 6⅞ | ,, B 3½ p.c. | 129–134 | .. | 5 2 7 |
| 108,075 | ,, | ,, | 5/17/3 | ,, C 3½ p.c. | 110–115 | .. | 5 2 0 |
| 352,000 | ,, | ,, | 6⅜ | Wimbledon 5 p.c. | 117–122 | .. | 5 0 5 |
| 98,000 | ,, | ,, | 6⅜ | Epsom 5 p.c. | 121–126 | .. | 5 5 2 |
| 88,416 | ,, | June 26 | 3 | 3 p.c. Deb. Stk. | 66–69 | .. | 4 6 11 |

Prices marked * are "Ex Div." † Next Dividend will be at this rate.

## WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

### Appointments, &c., Vacant.

LADY INTERVIEWER AND DEMONSTRATOR. Newcastle and Gateshead Gas Company.

DISTRIBUTION SUPERINTENDENT. Alliance and Dublin Consumers' Gas Company. Applications by Oct. 20.

JUNIOR DRAUGHTSMAN. Consett Iron Company.

DRAUGHTSMAN. Derby Gaslight and Coke Company.

FOREMAN (Manufacture of Carbolic Acids), Continent. No. 5939.

FOREMAN STOKER. Eastbourne Gas Company.

GENERAL CLERK. No. 5938.

CLERK. Weymouth Water Company.

### Plant, &c. (Second-Hand), for Sale.

GASHOLDER, &c. Wishaw Gas Department. Tenders by Oct. 28.

LAMPS. F. Parker, Duns Lane, Leicester.

### Meeting.

DANISH GAS COMPANY. Millbank House. Oct. 27. 2.30 o'clock.

### Sales of Stocks and Shares.

DUNSTABLE GAS COMPANY. London Mart. Oct. 20.

WANDSWORTH, WIMBLEDON, AND EPSOM GAS COMPANY. London Mart. Oct. 20.

### TENDERS FOR

### Coke.

SHEPPY GAS COMPANY. Tenders by Oct. 9.

### Sulphate of Ammonia.

TIVERTON GAS DEPARTMENT.

### Sulphuric Acid.

LEICESTER GAS DEPARTMENT. Tenders by Oct. 10.